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ICONES ORNITHOPTERORUM.

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DEDICATED TO THE MEMORY OF THE LATE J. O. WESTWOOD, ESQ., M.A., F.L.S.,
MEM. SOC. ENTOMOL. DE FRANCE;
ALSO MEMBER OF THE NAT. HIST. SOCIETIES OF MOSCOW, MAURITIUS,
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ICONES ORNITHOPTERORUM:

A Monograph of the Papilionine Tribe TROIDES of Hubner,

OR

ORNITHOPTERA

[BIRD-WING BUTTERFLIES] OF BOISDUVAL,

BY

ROBERT H. F. RIPPON,

CORRESP. MEMBER OF TORONTO NAT. HIST. SOC., &c.

VOL. I.

With 45 Coloured and Plain Plates and Maps by the Author.

- "The works of the Lord are great, sought out of all them that have pleasure therein."—*Ps.* cxi., 2.
"Seigneur! tu es digne de recevoir la gloire, l'honneur, et la puissance; car tu as créé toutes choses, et c'est par ta volonté qu'elles subsistent et qu'elles ont été créées."—*Apocalypse*, iv., 11.
"Cuan grandes son tus obras, oh Jehova! muy profundas son tus pensamientos."—*Salmos* xcii., 6.
"Es sollen dir danken, Herr, alle deine werke und deine Heiligen dich loben!"—*Ps.* cxlv., 10.
"Siehe, also gehet sein Thun; aber davon haben wir ein gering Wörtlein vernommen? Wer will aber den Donner seiner macht versteben?"—*Hiob* xxvi., 14.
"Lo, these are a part of His ways; but how little a portion is heard of Him? But the thunder of His power who can understand?"—*Job* xxvi., 14.
"Con las obras de tus manos me regocijo."—*Salmo* xcii., 5.
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DEDICATION.

To the late John O. Westwood (First Hope Professor of Zoology at the University of Oxford), M.A., F.L.S., etc., etc., with many other distinctions and memberships of learned societies in all parts of the civilised world, which were the natural results, fully merited, of the enormous amount of valuable work in many branches of Zoology and other subjects, which he accomplished during a long and industrious life—to the memory of this great and faithful master of Natural Science, I feel it an honour to dedicate this volume of my monograph.

Professor Westwood's writings and drawings illustrative of every order of insects, in addition to his palæographic and other works, are well known and highly valued throughout the world of Zoological and Archæological Science. They are so numerous that a list of them would fill a small volume; and up to the period of his death he was as unwearied in giving to the world the results of his investigations, as he had been in the earlier and middle portions of his long and useful life. If he had produced only his great work "An Introduction to the Modern Classification of Insects," which was published in two closely-printed volumes in 1839-40, the entomological world would have been laid under a deep debt of gratitude to him; for the work was such a masterpiece of learning, as to constitute it a valuable encyclopædia in itself of the subjects of which it treats. We need another man, gifted with Westwood's abilities and enthusiasm, to supplement his labours, by giving us two or three additional volumes, constructed on the same plan, in which should be incorporated the wonderful results of the investigations in Entomology of the many workers among all nations during the 50 years that have passed away since Professor Westwood wrote the last line of his great treatise. Such a work *must* be undertaken sooner or later—the sooner the better. Even then, amongst so much that has been splendidly accomplished by others, his contributions quite down to the year of his death will be found to be so numerous, and so valuable, as to bring him into continual remembrance. His work will be his monument while Entomology is studied; and no words of mine, or of others, are needed to enhance his fame.

One of the rewards of those who strive to enrich the world with their talents, is that, while "their works do follow them," they also remain with us and continually remind us of what it is possible for an earnest worker in any department of heaven-inspired labour to be to his day and generation, and to the generations that are to come.

And now, with the highest sense of the honour, I remind myself that Professor Westwood was one of the earliest subscribers for a copy of this monograph; that he took great interest in its progress, as his letters to me evidence; and that he willingly accepted my dedication of it to him.

Therefore, whilst I regret that he was not spared to see its completion, I am glad of the privilege of dedicating this First Volume to his memory, with the earnest hope that the beautiful Science which he adorned and advanced by his gifted labours, may attract an ever-increasing number of equally gifted and devoted workers in the future of Zoological investigation.

ROBERT H. F. RIPPON.

January, 1900.

PREFACE.

This Monograph is the result of the author's desire to leave behind him some memorial of his life-long love for the marvellous and varied works with which our God has so abundantly stored and adorned this beautiful world. He was anxious to leave something which should be permanently useful to all those who cared to study at least one small part of those creations which the author (while he fully accepts and rejoices in the teachings of Evolution) nevertheless regards as the crystalised thoughts of our loving Creator. The author had no particular ambition in employing his pen and pencil, to attain to more than this; feeling as he does that it is impossible for anyone to propose to himself any worthier task than to try and make the world a little richer in some way, intellectually or spiritually, for his having been an inhabitant of it. He hoped that (whilst he was very poorly equipped with financial resources) by doing the whole work of this monograph with his own hands and brain, he would be able to make it pay its expenses, which he was aware could not be small. As a matter of fact, even under these conditions the work thus far has cost *very much* more than has been received for it, and the labour involved has been much greater than was expected, and these have been two of the many difficulties which have tended to delay the completion of it for so much longer a period than the author anticipated.

For several years preceding the commencement of this undertaking the author had contemplated monographing some special group of marine or land shells, or some particular family of butterflies or moths (for either of which he could find plenty of materials in his own collection as the nuclei of a more extensive survey), and publishing it himself at as small a price as possible. But as it is always so much easier to originate ideas than to carry them out, the author was continually reminded by unhappy experience that such an undertaking, with his limited resources, could not be entered upon with a light heart, even if it were to be attempted at all. However as the years passed, and he was unwilling to delay indefinitely, he decided to forego the larger idea which he had in his mind, and which some conchological friends were anxious he should enter upon, and by selecting some very small group of butterflies which had not been too exhaustively worked up, to endeavour to produce as complete an illustrative monograph of that group as he was able, limiting it to a definite and not excessive number of parts. The Ornithoptera seemed to afford just the subject for his purpose. They were not very numerous in species, they were very magnificent in character (next to the morphos, the most beautiful of butterflies), and no monograph of what was then called a *genus* existed. Several of the varieties had only been described without figures, or figures of both sexes did not exist; these descriptions and figures were scattered far and wide through the pages of Entomological literature, adorning such works as Cramer's "*Papilio Exotica*," Felder's "*Reise Novare*," Westwood's "*Cabinet of Oriental Entomology*," Doubleday and Hewitson's "*Genera*," Gray's "*Catalogue of Lepidopterous Insects of the British Museum*," Boisduval's "*Species Général*," "*The Voyage of the Astrolabe*," and the Transactions and Proceedings of Societies, British and Foreign. Many of the figures adorning these works were magnificent, and all the descriptions most useful and instructive—albeit the very long latin diagnoses of Felder were trying to the ordinary student. But a great number of synonyms had unavoidably been created; slight new varieties were continually being described as species, and there was much confusion with regard to the sexes, so that some of the species did not always get their proper mates—a grave irregularity which it was most desirable should be remedied at the earliest possible moment. To the ordinary student in any department of zoology it is ever most difficult, if he have no big or costly library of his own, to obtain the information which he requires about his special subject of investigation: often much time and labour have to be expended, and the results are still unsatisfactory. Monographs have a very special *raison d'être*. They supply a very urgent need, if they are properly written; and so it seemed to the author that he could wisely employ his time and energies in the preparation of an illustrated monograph which should, within the covers of one or two volumes, furnish to the student of the Ornithoptera a fairly exhaustive view of the subject up to the date of completion, with illustrations of each form so accurate that it should be easy to determine any species of the group with sufficient facility to render such a work welcome.

In the year 1884 the author spoke of his proposal to his friend the late Philip Henry Gosse, F.R.S., and the well-known author of some delightful works on marine and land zoology, and whose paper "On the Clasping-organs Ancillary to Generation in certain groups of the Lepidoptera," published in the Trans. Linn. Soc. Lond., in April, 1883, included his investigations of this subject in 12 species of Ornithoptera.* The following extract from his letter contains Mr. Gosse's reply:

"Sandhurst, Torquay, 11/1/84.

"My dear Friend,
I rejoice with you in the acquisition of 2 *Ornithopt. Brookeana*. Your projected monograph of the genus will, I am sure, if carried out, be very valuable. If I be alive and well at the time, I shall think it a privilege to be a subscriber. Meanwhile, would it be of any use to you to have a number of examples of *O. Remus*, *Haliphron*, and *Leda* (Wall.), in *battered condition*, for anatomical examination? I have several of each from Celebes, utterly worthless for the cabinet, which I would gladly give you.
"Yours, &c.,
"P. H. GOSSE."

*The species treated of are *D. Zalmaia*, pages 269, 271, 272, 276, 278, 324, with figs. 25-28, Pl. XXXII. *O. Richmondia*, pages 278, 281, 284, with fig. 5, Pl. XXVI. *O. Aryana*, pages 271, 274, 275, 281, 282, with figs. 1-3, Pl. XXVI. *O. Pronoma*, pages 281, 283, fig. 4, Pl. XXVI. *T. Brookeana*, pages 275, 281, 291, figs. 5-8, Pl. XXVII. *P. Remus*, pages 277, 281, 293, 335, figs. 12-20, Pl. XXVII. *P. Haliphron*, pages 279, 277, 281, 284, 335, figs. 6, 7, Pl. XXVI. *P. Darsius*, pages 281, 286, 287, figs. 8-11, Pl. XXVI. *P. Rhadamantus*, pages 269, 271, 281, 289, figs. 12-16, Pl. XXVI. *P. Amphrysus*, pages 276, 281, figs. 9-11, Pl. XXVII. *P. Helicon*, pages 281, 290, figs. 1, 2, Pl. XXVII. *P. Heliconides*, pages 281, 290, figs. 3, 4, Pl. XXVII. In addition to his own masterly treatment of this subject Mr. Gosse quotes from De Haan's *Bijdragen tot de Kennis des Papilionidea*, in the "Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen" (Trans. regarding the Nat. Hist. of the Dutch Over-the-Sea Possessions,) giving references to *P. Amphrysus*, which are illustrated in that paper by 3 figs.; and also from Dr. Burmeister's *Lepid. d. l. Rep. Arg.*, p. 21.

It is almost needless to say the author availed himself of Mr. Gosse's kindness. But nearly five years elapsed before he commenced the monograph, when there seemed a prospect of his relieving himself of the responsibility of being his own publisher, and devoting himself entirely to the production of the work. However, before the issue of the first part he found it would be wise to be his own publisher, and altogether to take every responsibility upon himself. Since then he has laboured unceasingly on this work, with many difficulties financial, of ill-health, and other obstacles, to contend with—ever full of hope and determination—assured that He who had helped His servant thus far, would give him in due time the joy of completing the work. It will be readily understood why he has had, and may have for a while longer, to make such demands on the patience of his subscribers, when it is understood that in addition to all the work needed in preparing the letter-press, and drawing the plates, the author colours with his own hands every copy of every plate that is published, and personally delivers or sends the parts to each subscriber when ready for them. But he trusts that whatever faults and shortcomings the work may exhibit, (and he is fully conscious of many of them) it will still be regarded by every lover of exotic entomology, as much better to have been done than to have been left undone—a conclusion which will render him grateful to God and man.

At the commencement of this monograph, the materials which would enable us to decide upon the true rank of the Ornithoptera among the Papilionidæ were unfortunately much more restricted than at the present time; and in the future we may confidently anticipate an accumulation of still more valuable and instructive examples of the group, which may modify or even completely alter our views on the subject; for there is no finality in entomology any more than there is in other departments of science. But even at an early period of this work, a close study of the different forms composing what was then called the Genus Ornithoptera convinced the Author that the position assigned to the so called genus among the Papilionidæ, by nearly all authors, was the correct, or nearly correct one; that these insects, though in some respects it was difficult to say in what important characters they differed from the other Papilios, for several good reasons were allowed to take precedence of them, as a distinct genus; that the number of good, substantial species was really very small—indeed, more restricted than even was at first suspected—despite the great number of names that had been given to them; and that, while the number of local forms and varieties was already large, it was certain to become much larger, as new and especially insulated localities were explored. Now this is exactly what has been taking place. The subsequent great increase of materials has not modified these impressions, though it has greatly enlarged them, and given him a sense of the glory of the group, which may be compared with the feeling one experiences when thinking of the even greater advance in discovery and knowledge, in Ornithology for example, of the numerous species, and the astounding beauty and strangeness of form, of the Birds of Paradise. Indeed, as the author has ventured to suggest in another place, seeing that the most glorious of all the Ornithoptera, those of the genera *Schoenbergia* and *Ætheoptera*, seem to inhabit geographical areas identical with or near the metropolis of these birds, and are as beautiful in their way as the Birds of Paradise, these species of Ornithoptera may well be called the BUTTERFLIES OF PARADISE.

For reasons recorded in their own proper place in this work, it was found necessary at first to divide the genus Ornithoptera into three sub-genera—later on to give these full generic rank, viz., ORNITHOPTERA (with its section Priamoptera), TROGNOPTERA, at that time consisting of only one species, and POMPEOPTERA. At the same time there were two remarkable forms, one a ♂ and the other a ♀ (only one example of each) whose position in the group it was difficult to understand. These were De Haan's ♂ *Tithonus* and Gray's ♀ *Victoria*. These were obviously distinct as species from any of the Priamus group, whilst appearing to have a close affinity for it. The question then arose, is the ♀ *Victoria* the mate of the ♂ *Tithonus*, or do they each belong to distinct species? Ultimately the discovery of the gorgeous and remarkably formed ♂ of *Victoria* and many more ♀ by Mr. Woodford in the Solomon Islands, and, a little later on, the description, by Mr. Salvin, of the allied form *Regina*, and the discovery of De Haan's *Tithonus* (both sexes) in the island of Waigieu, enabled us to more properly study their affinities with the group to which they belong, with the result that they fall into two distinct genera, one of which should immediately precede, and the other succeed, the genus ORNITHOPTERA (or the Priamus group, as it was called). The addition of the tailed *Sch. Paradisea* to the Ornithoptera supplied the genus for *Tithonus*. It is to be noted that all the members of the genus ORNITHOPTERA, in the ♂ sex, were distinguished by the presence on the anterior wing of a pupæform sericeous band; this character is also found in *ÆTHEOPTERA*, while the form and colouration of the ♂ is quite distinct from those of the Priamus group, and the ♀ is also quite unlike any ♀ of the genus ORNITHOPTERA. On the contrary both *Paradisea* and *Tithonus* ♂ possess no stigmatic band, their abdominal marginal fringe is very long, dense, and white or light sienna tone, and their females are quite different in appearance from those of *Victoria* and its congeners, and though somewhat like those of Ornithoptera, are yet abundantly distinct from them. *Victoria* therefore became the type of *ÆTHEOPTERA* and *Paradisea* of the genus *SCHOENBERGIA* (or, as Pagenstecher suggested, but without characterising it, a subgenus).

The genera TROGNOPTERA and POMPEOPTERA are, in the ♂, possessed of an abdominal marginal fold or pouch, concealing the androconia, and the ♂ of the red and black South and Central American Papilios, or as the Author proposes to call them ORNITHOPTERINA, are possessed of a similar character in the same position.

In addition to these genera it was necessary to admit Drury's *Papilio Antimachus*, and Hewitson's *P. Zalmoxis* (both West African species) to the ranks of the Ornithoptera, to place them undoubtedly before *SCHOENBERGIA*, and to include them in the genus DRURYA (created by Aurivillius in 1880) for the type *Antimachus*. It was suggested to the author that White's *Ridleyanus*, also a W. African species, should come into the group, but as he has shewn, this papilio is by no means related to the Ornithoptera. With regard to the Ornithopterina they will have to be separated into 2 genera at least, which when properly studied will reveal some remarkable analogies to both ORNITHOPTERA and POMPEOPTERA.

As we have therefore a number of genera included among the Ornithoptera, it appeared to be wise to regard them as worthy of being associated together as a tribe, the Papilionine tribe TROIDES, a generic name given to

this group of butterflies in 1816 by Hubner, and adopted by Mr. Rothschild [in his very valuable and masterly "Review of the Papilionidæ of the Eastern Hemisphere, exclusive of Africa, (Novitates Zoologicae, Vol. III., 1895)"] as the *generic name* of the whole of the Ornithoptera without distinction, therewith introducing a trinomial and possibly quadrinomial nomenclature, which it is difficult to believe he will not, with his great knowledge, ultimately modify, as being cumbersome and inconvenient to the ordinary student.

That the whole of the so-called species included in the author's restricted genus Ornithoptera, or the old *Priamus* Group, may well be regarded as geographical forms of the type species *Priamus*, it will be wise to admit; and this most entomologists are agreed upon. The superficial differences, *i.e.*, those of pattern, are not too great, especially in the ♂ sex, and the external structural characters so far as they have been studied, do not appear to diverge in any *important* degree throughout the multitude of named forms, from the type species.

It would appear that the whole of the Ornithoptera are in a very unstable condition, none of the forms appear to be as approximately permanent in pattern and colour as *Vanessa atalanta*, *V. Urticae*, *Danaüs Archippus*, or even the American *Argynnis*. In both sexes it is almost impossible to find a specimen in which the markings are symmetrical on both wings, on either surface; and still more difficult to find two examples which in size and markings are absolutely alike; while the intensity and quality of colour differ to a wonderful extent throughout the group. Of course all this instability is intended to enable different members of the group to adapt themselves to the varied conditions of their numerous island homes and continental environments, and to the changes which in the former at least are incessantly taking place—changes which, while they may not be apparent to us, yet are capable of slowly but profoundly modifying the morphological character of all animal and vegetable life.

The nominal species which appear to afford the most stable specific characters are—1st, the type form *Priamus*, which is always large, very melanistic or fairly light in the ground colour of the ♀, and with the anterior wing-cell immaculate; but an occasional example will be met with where the cell has a small light patch in it; whilst occasionally the cell of other forms will possess only a rudimentary mark, or it may be altogether absent, notwithstanding that the rule is for the cell in all those other forms to exhibit a more or less light patch. 2nd, *Richmondia*, from the Richmond River, Australia, which only differs from *Cassandra* in being the smallest of the genus Ornithoptera—its variations on the under surface of the ♂ being as numerous as are those of *Cassandra*, and identical in patterns: in other words that given a special variation of pattern in the larger species, the same pattern may be found in the smaller, a phenomenon that is very suggestive. So that *Richmondia* is simply a geographical name for *Cassandra*, only justified by the small size of all the specimens which inhabit the district of the Richmond River. It may be remarked, however, that some *very small* ♂ example of other species have been met with that are not larger than the average *Richmondia*, while on the other hand some abnormally large specimens of the ♀ of *Cassandra* may be found in collections. 3rd, *Cræsus*. The colour of the ♂ of this species is very permanent in its character—generally, however, betraying a tendency to become less red and more yellow and green in specimens that are bred. As everyone is aware the ♀ of the two forms *Cræsus* and *Lydius* are very distinct—the latter being quite abnormal and acœroid, and permanently so, so far as our knowledge of it goes. 4th, *Urvilliana* is distinguished by the ♂ being apparently always blue, green blue, violet or lilac—though the size and markings—but more especially the scaling of the posterior wings present many diversities extending from the type form to the interesting geographical variety (*Celestis*, Rothschild) from the Louisiade Archipelago. In this latter the light mark in the anterior wing-cell of the ♀ is very fairly uniform in shape and size in all the examples that have been collected. The individuals of both sexes are also smaller than those from other localities, and the colour of the ♂ is very blue. Now the ♀ of *Urvilliana* vary to a considerable extent, in depth of colour, from a very light sienna brown to the darkest brown—the light markings present every degree of size, shape, and division that is found in other so-called species of the *Priamus* group (notably in *Poseidon*) and they are nearly always large-sized insects; so that the differentiation from other species is always less in this sex than in the ♂—notably so in the case of the New Britain example of *Aruana* and *Urvilliana*.

But while all these facts tend to unite the different forms of the genus Ornithoptera (as the author restricts the genus) into one good species, there are other peculiarities of the ♂ which render the evidence of that unity overwhelming. (a) The general pattern of all the ♂ throughout the group is really very uniform, especially on the anterior wing, and so is the colour. We have in *Priamus*, *Cassandra*, and *Richmondia* black and green wings (more or less golden green), with a varying extent of black or colour scaling common to all the species of the genus. The shape and size of the green subcostal band, and of the inner and outer marginal green band are always similar—so much so that a tyro, seeing only plain figures of the species is apt to suppose that they all belong to one species. In the three species quoted, the median vein of the anterior wing is not indicated by green atoms or scales; but from, and including *Pegasus* all the forms are more or less green scaled along this vein and its branches; in a few examples this green scaling becomes so extensive as to encroach largely over the dark area of the wing, and to suggest the possibility that some day examples with the upper wings entirely green may be discovered. In *Cræsus*, this scaling is not present; but it re-appears in *Urvilliana*, in some examples. On the posterior wings there is generally a discal row of suborbicular black spots, ranging in number from 5 to 1. In the three species named these are larger; and never probably entirely absent; but in all the other species from *Pegasus* to *Cræsus* they are generally not so large, or only rudimentary; and in many examples are entirely absent. In *Urvilliana* they are sometimes small, varied in number, but generally large, and often fused into the dark scaling of the lower wing. In all the forms this scaling, which is densest at the base of the wings, is generally present, varying in the extent of its area, till it seems to attain its greatest development in some of the examples of *Urvilliana*. On the underside of the hind wings of all the species this row of black spots is always present: the spots are longer than above, more irregular in shape, and always either six or seven in number. Again,

on the lower wings of the ♂♂ we find in *Priamus* one, and sometimes more, small golden yellow submarginal internervular spots: these may be between any of the veins, or in any part of the submarginal area; they may be found, one, two, or more, in examples of most of the species, except *Urvilliana*; always very small, except in *Cræsus* where they are larger, vary from 2 to 4 or 5. In *Cræsus* and *Lydius* also there are always 3 or 4 larger silky golden yellow spots or marks in addition—the largest often occupying nearly the whole of the discoidal cell, and a great part of the costa. All these spots and marks correspond to similar more extensive marks on the undersurface, and transmit the light through the wing. When, however, the submarginal group only appears on the undersurface (as it generally does in full number of spots) without the corresponding marks above, the light is not transmitted. But these spots may probably be intended to serve a similar purpose to those semi-transparent spots of nude-membrane found in the genera *Doleschallia* and *Kallima*, and the larger ones in the wings of the Heterocerous genera *Attacus*, *Antheræa*, &c. These spots and marks are quite analogous to the golden yellow patches and spots on the secondary wings of the ♂♂ in the genus *SCHOENBERGIA*, where they have attained their maximum development; they also appear as square submarginal spots, fairly large, in *ÆTHEOPTERA*; but in both genera they are sufficiently distinct from those of *ORNITHOPTERA* and of each other, to show that the forms of each genus are rightly specialized. Another characteristic of the species of the genus *ORNITHOPTERA* is this:—If the ♂♂ of *Priamus* and allied species are examined obliquely against the light, the whole of the green area of the wings—especially the anterior wing—will be seen to be shot with opalescence, golden orange, yellow, and different shades of blue and violet, changing according to the obliquity of position from a pale dead salmon tint to the violet, till no trace of green remains, causing the insect to resemble successively both *Cræsus* and *Urvilliana*; and the fresher the specimens and the stronger the light, the more intense will these reflections be. On the contrary if *Cræsus* be subjected to the same positions of light the reflections will be green, so that the insect will appear like a *Poseidon* or *Aruana*; *Urvilliana* only gives salmon or silvery, and slightly green reflections, but a var. exists (a permanent var.) *Bornemannii*, which is really as green as a *Pegasus*, or a deeper green than a fresh example of *Pegasus*; it has also the green scales along the median vein, and its reflections make it in a proper oblique position to resemble *Cræsus*. It is found in New Britain, and appears to unite *Aruana* with *Urvilliana*, and really might be mistaken for anything rather than a var. of the species *Urvilliana*. The ♂ of the species *Schoenbergia Goliath* has lately been discovered, and named *Supremus* by Röber, and *Elizabethæ-Reginæ* by a Hungarian entomologist. It is a combination of the characters of *Tithonus* and *Cræsus*! To those who would group together the forms of *SCHOENBERGIA* and *ÆTHEOPTERA* it would have been less surprising if it had exhibited a combination of the colour and pattern marks of *Tithonus* and *Victoria*.

Of the different named forms of the genera *SCHOENBERGIA* and *Ætheoptera* it is too early to decide upon the number of species which may ultimately be admitted; probably many more, at least of *Schoenbergia*, will be discovered; and probably ♂♂ with short tails and gradations of tail may turn up, and unite *Tithonus* with *Paradisea*—judging by the discovery of the ♂ of *Paradisea*, v. *Meridionalis*, which is also tailed (and a remarkable tail it is!) and in many ways so distinct from the type form as to justify a full specific rank being given to it. The most extraordinary forms may yet reward those who explore the archipelagoes and the interior of New Guinea. At present the three forms of *Ætheoptera* bear, in both sexes, so close a resemblance to each other as to suggest that, while more varieties may be discovered in the Solomon Archipelago, they will only, as *Reginæ* and *Regis* are, be local differentiations from the type *Victoria*.

It therefore remains for the author to indicate the few changes in the classification of the Sub-family Papilioninæ which are indirectly the result of the arrangement proposed on page (6). As the Papilionidæ are divided into the two Sub-families *PIERINÆ* and *PAPILIONINÆ* it will be convenient to regard the 2nd sub-family as being composed of a number of tribes, of which *Troides* would be one. The 1st of these should contain the genera *Mesapia*, Gray; *Calinaga*, Moore; *Styx*, Staüding; and perhaps *Hypermnestra*, Ménétries,—a group whose neuration is most like that of the *Pierinæ*, in that it has only 3 branches to the median vein of the anterior wings.

The second tribe would comprise the genera *Doritis*, Fabricius; *Parnassius*, Latreille; *Eurycus*, Boisduval; *Euryades*, Felder; and *Lühdorfia*, Ersch,—in all of which, except in the first genus, however much they may differ in appearance, at a special period, subsequent to their union with the males, the females exhibit a peculiarly secreted waxy or corneous pouch on the anal segment of the abdomen, which appears to be the result of that union at the time of coition, and the purpose of which is yet involved in obscurity. Mr. Elwes, who has closely studied the *Parnassii* thinks that the last 4 of these genera should form a separate family, or perhaps he would mean sub-family,—a proposal worthy of considerable respect. It will at any rate be doing them justice to give them the rank of a tribe in the suggested arrangement.

The 3rd tribe would include the genera *Serecinus*, Westwood; *Thais*, Fabricius; and *Armandia*, Blanchard.

The 4th tribe would consist of the genera, *Teinopalpus*, Hope; and *Leptocircus*, Swainson.

The 5th tribe would be our *TROIDES*, though it would seem that some other genera intermediate between *Serecinus* and *Drurya* are needed to more naturally link together the last 2 tribes. The foregoing are suggested, subject to modification, when we get to know more of these genera, and become possessed of the numerous allied species which probably yet remain to be discovered. At any rate the tribe *TROIDES* will have a secure position, though new forms and even new genera may in the future be discovered and included.

The proposed classification would therefore stand thus:—

FAMILY PAPILIONIDÆ, LEACH, 1819.

Sub-Family II., PAPILIONINÆ, Swainson, 1840.

TRIBE 1. [*The Median Nervure of the anterior wing with 3 branches.*]

Genera: i. *Mesapia*, Gray. Thibet; ii. *Calinaga*, Moore, Sikkim; iii. *Styx*, Staudinger, Peru; iv. *Hypermnestra* (?) Mén., Turkestan.

TRIBE 2. [*The Median Nervure of the anterior wing with 4 branches; the ♀ with a waxy or corneous secretion attached to the underside of the anal segment of the abdomen in all the genera but Doritis.*]

Genera: i. *Doritis*, Fab., Europe and Asia Minor; ii. *Parnassius*, Latr., Mountainous districts of Europe, N. and Central Asia, Japan, and California, &c.; and also in low and wooded districts; iii. *Eurycus*, Boisd., Australia; iv. *Euryades*, Feld., Uruguay and Paraguay; v. *Lühdorfia*, Ersch, Japan (tailed in both sexes).

TRIBE 3. [*Tailed in both sexes, median nervure of ant. wing 4-branched.*]

Genera: i. *Serecinus*, Westw., N. China; ii. *Armandia*, Blanch., Bhutan and Thibet (the 3 branches of the median nervure of the posterior wing tailed, the first being the longest).

TRIBE 4. [*The antennæ strongly clubbed. Median vein as above.*]

Genera: i. *Teinopalpus*, Hope (the ♂ tailed in the usual manner of the tailed Papilios; the ♀ with a short tail from the 2nd posterior median nervule, and a longer curved tail from the 2nd subcostal nervule) N. India; ii. *Leptocircus*, Swainson, (with a very broad tail-like prolongation of the posterior wing) Indian region, Siam, Java, Celebes and Philippines.

TRIBE 5. *Troides*, Hubner. [*Median Nervure of ant. wing 4-branched; antennæ stout, with the club or apex more or less curved.*]

GROUP I. THE ACRÆOID ORNITHOPTERA.

Genus 1: *Drurya*, Aurivillia. (The antennæ well clubbed), West Africa.

GROUP II. THE TRUE ORNITHOPTERA.

Genus 2: *Schoenbergia*, Pagenstecher. (The male of two sp. tailed.) New Guinea and Waigieu.

[*The anal valves of the ♂ are divided dorsally and subdorsally: the whole annulus being very distinct in form from the other abdominal articulations and pointed at the terminal; the valves would evidently open wide in the act of coition, but the entire valve must be capable of considerable movement in a downward direction at least; the direction of the valve sutures is indicated by the triangulate black mark, which decorates the annulus in all the genera, but most obtrusive in SCHOENBERGIA and ÆTHEOPTERA, and the least in POMPEOPTERA.*]

Genus 3: *Ornithoptera*, Boisd. The ♂ ♂ golden green and black with a pupæform brand (the ♀ ♀ brown and white, grey, or yellow), N.W. Australia, N.S. Wales, New Guinea, and Molucca Islands.

Section, *Priamoptera*. ♂ ♂ violet, or orange red and black, ♀ ♀ brown and white, or grey. New Britain, N. Ireland and Solomon Islands, and Louisiade Islands. A green variety of the ♂ also occurs in New Britain.

Genus 4: *Ætheoptera*, Rippon. The ♂ ♂ Golden green, yellow and black, with a pupæ form stigma surrounded by a slightly obscure opalescence, but often very intense in some examples; the posterior wing strongly excised at the anal angle; the ♀ ♀ brown, with white and yellow markings on both surfaces of the wings. Solomon Islands.

Genus 5: *Trogonoptera*, Rippon. [The ♂ with an abdominal marginal fold or pouch for the Androconia.] Borneo, Sumatra, Labuan, and Philippines.

Genus 6: *Pompeoptera*, Rippon. [The ♂ with a similar abdominal marginal pouch: species of both sexes generally black and yellow, except *P. Doherty*, Rippon, in which the sexes are nearly unicolourous on both surfaces—the ♂ black (with a little yellow), the ♀ brown.] In localities ranging from Ceylon, India and China to the Malay, Philippine, Malacca, and other archipelagoes, N. Australia, and New Guinea.

GROUP III. ORNITHOPTERINA, RIPPON.

[The ♂ with an abdominal marginal pouch.] Prevailing colours: black and green, and red; bronzy-blue, green, black, white, and red; black, red, and white; and black, white, brown, and red; ♀ of some species tailed. Types of possibly 2, 3, or 4 genera;—*Papilio Crassus*, Cram.; *Pap. Sesostris*, Cram.; *P. Mylotes*, Bates; *Pap. Polydamus*, Linn.

Referring back, in the foregoing table, to Tribe 4, the genus *Teinopalpus* is made to take its place next but one to the Acraeoid Ornithoptera, the 1st genus of the Tribe TROIDES. Of this beautiful genus (only one species of which is at present known) Doubleday, in his diurnal Lepidoptera, remarks that "there is little in its structure beyond its long porrect palpi to separate it from *Ornithoptera* or *Papilio*, though some of its peculiarities indicate an approach to *Thais*, a genus in which the palpi are more developed than in any other of the Papilionidæ, with the exception of *Teinopalpus*." It may be added, however, that the whole form of the head in front of the eyes is more prolonged, being equal in length to the distance from the outer extremity of the eyes to the commencement of the pronotum; but it terminates as a point, i.e., forms a cone covered with green hairs, the base of which may be considered to be either the front of the eyes or the commencement of the pronotum. The palpi are partly covered by this cone, but in both sexes they project beyond. In the Ornithoptera the palpi are quite concealed beneath the villose tuft which emerges only slightly beyond the eyes. The abdomen in both sexes is unlike that of Ornithoptera in character; the anal valves of the ♂ bear little or no resemblance to those of any of the Ornithoptera, and the red antennæ are short and strongly clubbed, similar to the black antennæ of the Acraeoid Ornithoptera; the legs also are altogether shorter in proportion to the size of the insect than in the Ornithoptera. The antennæ in their form and length, though not in colour, are most like those of *Thais*, and the same may be said of the form of the front of the head and palpi of *Thais* when viewed in company with *Teinopalpus*. But the body differs from *Teinopalpus* much more than it seems to differ from the AGARISTIDÆ moths.

There is a species of *Papilio*, *P. Antenor* from Madagascar, which is remarkable in possessing antennæ that like those of *Teinopalpus*, are brick red, an unusual colour for *Papilio*, in which these organs are generally black; but they are long, and gradually thickened towards their apex, being like those of the true Ornithoptera, though they often are pointed straight forward, like those of many of the *Nymphalidæ*. There are several points of similarity with the Ornithoptera in *P. Antenor*, suggesting that if it is not ultimately admitted into their ranks, it would have to be placed very near them. The body or abdomen of *Antenor* is light coloured—an unusual character in the *Papilios*, but almost entirely the rule among the Ornithoptera, though becoming less stringent in Pompeoptera, and when they reach the Ornithopterina. The annulations of its light abdomen are well accentuated by the same delicate brick red as that of the antennæ and of the villose tuft between and in front of the eyes. The anal valves are almost exactly like those of Ornithoptera in form and general structure; and the basal segment of the abdomen is black like the thorax, with the 2nd and 3rd annuli accentuated with black and brick red. In these respects, except in colour, the body quite resembles those of the Ornithoptera. There are many points of similarity between the legs of *Antenor* and the Ornithoptera; but the 5th or terminal joint of the tarsus of the former is proportionally longer than in the Ornithoptera. Of course, although the wings and wing patterns seem very dissimilar from those of the Troides tribe, there are some points that are suggestive. Ultimately, it may be, *Antenor* will have to be admitted into this tribe, as the type of a special genus; but at present it will be difficult to say where it should be placed. The author has much pleasure in acknowledging his indebtedness to Dr. K. Jordan for first calling his attention to the structure of the ♂ valves of *Antenor*, while at the same time expressing his opinion that there were no characters in the genus *DRURYA* that would justify the author in admitting that genus among the Ornithoptera. Though this is contrary to the views of Staudinger, and other of the Continental entomologists, and he still hopes that he has made no mistake, yet the author has the deepest regard for any opinion expressed by Dr. Jordan on the Lepidoptera, because of the immense knowledge, morphological and otherwise, which he possesses, with the advantages of being the curator of probably that most wonderful accumulation of entomological material in the world which has its home in the Hon. W. Rothschild's Museum at Tring. But as every arrangement and conclusion in zoology can, at the best, be only provisional, the author fully anticipates that in the future, when the lepidoptera have been morphologically studied throughout all their families and genera, and their life history entirely unfolded, the whole of our different systems of classification will have to go to the wall, and give place to an arrangement that would surprise us all, if we were privileged to be living on earth at that time. Towards this advance in knowledge Dr. Jordan will, if he is spared for a few years, be sure to contribute more largely than perhaps any of us can at present foresee.

As it may be thought by some, though no one has suggested it, that the measurements of the legs, wings and other parts of the species described in this work were useless and would be of no value, the author would here observe that though at present there is little prospect of such measurements being of great use, even if carried out on a really extensive plan, yet it would be unwise to assume that this will always be the case. The relative measurements of any of the parts of the lepidoptera are not really trivial or useless, though at present they may seem so; every fact is important; and such measurements may in the future be the means of bringing us valuable knowledge, if systematically pursued by students of this order of insects. In studying the characters of the Coleoptera, for example many species are created and even genera formed almost entirely on a consideration of the relative lengths of the joints of the tarsi, or of the articles of the antennæ.

To return to the exterior form of the ♂ sexual apparatus, which in the Troides is generally very unlike that of the other Papilionidæ, with some few exceptions, it may be briefly stated that the valves are attached to the overlapping edges of the 8th or terminal abdominal segment, and consist of a pair of broad plates of a generally ovoid or semi-ovate shape, and the outline of the whole segment usually is more or less trigonal when viewed from above. They are generally pointed at the end, more especially so in the genus Pompeoptera, where, in a state of rest the point of the

right valve sometimes slightly overlaps that of the left. These valves are united to the penultimate segment of the abdomen by fully working joints. It is possible that, while this portion of the abdomen may generally be curved downward for union with the ♀, it may be capable of moving in the upward direction also—especially as the ♀♀ of some of the tribe are known to woo the ♂♂, as the author has shown in another place. These valves are convex externally, and concave internally: their purpose is to enclose the *genitalia*, &c. The valves are closed on the exterior with scales similar to that of the body; their free edges have generally a fringe of hair-like scales, which in some species are denser than in others, and likewise longer: they serve to protect the genital cavity when the valves are closed, from dust or any injurious matter which might otherwise drift in—the fringed edges are in close contact when the valves are at rest; the edges are sometimes slightly grooved without, so that the fringed edges appear to be doubly efficient for their purpose, by protecting a small portion outside the valves as well as in guarding the opening of them. The valves of *Aruana* and *Amphrysus* are densely fringed with these hair scales: *Brookeana* still more so. Of course as Philip H. Gosse has shewn, there are many variations of form, and structure found even among the Ornithoptera, to say nothing of the other Papilionines. He also suggested a better name for these organs than valves namely *κοιλιδοσ* (a sheath or scabbard).

The larvæ of the tribe TROIDES are large, heavy looking creatures, dark in colour generally; their segments are armed with a number of thick, obtuse, sometimes rather sharp, fleshy protuberances, varying probably from 3 to 6 on each segment; and each of the retractile nuchal tentacles is enclosed in an external sheath. In Ætheoptera the fleshy protuberances are somewhat different in colour and shape from those of Pompeoptera; but more particulars on this subject will be given in the 2nd vol. of this work. Of larvæ that bear a close resemblance to those of TROIDES *Papilio diphilus*, Esp., and *P. Hector*, Linnæus, may be cited. Of the chrysalids it may suffice to say in this place that they appear to bear a very close resemblance to each other throughout the tribe, as the Pupa plate in the 2nd vol. will show.

It may be interesting and instructive at this point to bring before our minds a brief description of what the *ideal* pattern of the genus *Ornithoptera* would be; and this will help us to understand how naturally the different so-called species of this and other genera have been able to vary in pattern as they have, and what possibilities there may yet be in store for them, as their environments slowly but surely become modified.

The ♂ anterior wings velvety black; a more or less broad subcostal band of green, extending from near the apical angle to near the base of the wings; a narrow band of green along the inner margin from the base to the posterior or anal angle, proceeding from thence up the posterior or hind margin *nearly* to the apex or anterior angle, but divided more or less in the upper half of its course by the veinlets; all these green marks are softened into the black by green atoms or scales; a brown discal pupiform stigma (entirely a ♂ character); the median vein and its branches absorbed in the velvety black of the wing.

[Note: The median and other veins with a tendency to become green-scaled; and the green areas of the veins may (and sometimes do) encroach, until perhaps at some future time nearly or quite all the upper wing may become green; but the wing will never become all black. The green is dark originally, but becomes more golden; and forms may be found yet where the golden tone will be so great as almost to eliminate the green in some lights at least; the green always shot with purple, opal, or fiery orange reflections, when viewed in the right position; the green may and does become intense golden orange or lilac, blue or violet, (or yellow). The pupæform stigma may either be very black, so as to be almost indistinguishable from the black (in which case it exhibits silvery reflections if viewed in the proper position) or a rich red brown, and very prominent.]

The under surface of the anterior wing very dark brown; the discoidal cell with a blue-green spot or mark at the lower portion of the distal end, which is of no great extent; a discal broad transverse band of blue-green, extending from the submedian nervure up the wing to between the 3rd and 4th subcostal nervules; this band is divided distinctly into separate parts by the veins and veinlets and their black borderings, and so divided at its outer third by black lunate marks between the veins as to separate the outer 4th and make them appear as if they were independent green spots: these are always more golden green than the rest of the band.

[Note: This band may be so broken up as to become a double transverse row of green spots: it does especially so in the Australian *Cassandra* and *Richmondia*; or the black spots may become very small, as in some *Aruanas*; the green of the cell may become more extensive, and the entire area of the wing may possibly become quite green, or intensely golden green, or greenish-blue, or golden-yellow green; but an orange, blue, or red underside is a sunlikely to appear as a blue rose or dahlia in the plant world.]

Posterior wings green; a discal row or band of variously shaped black spots parallel with the outer margin 4 or 5 in number; a submarginal black band from the anal angle to the base of the costa; base of the wing above the precostal veins black; a scaling of black atoms from the base, which *may* spread over the whole wing.

[Note: The green colour can vary from an olive golden-yellow to blue-green, blue, purple, violet, and fiery orange; the black spots may be very large or very small, or obsolete, or rudimentary, or entirely absent, or vary from 0 to 5; small golden silky submarginal spots may also be present between the black marginal border and the black spots, in numbers varying from 1 to 4; the cell also, and the upper part of the disc, may have golden silky marks, generally of a fairly large size, as in *Cræsus*. The colour reflections of such wings will, when the wing is golden orange, be green.]

Under surface of posterior wings green, but golden-green or yellow towards or at the outer margin and the costal

margin ; a discal band or row of variously-shaped black spots 7 in number, including the black patch of the anal angle ; the margins all more or less broadly and irregularly black ; a row (between the discal spots and black margin) of golden silky spots in the yellow or yellow-green, and a large cuneiform golden mark or cone with its apex pointed towards the bases, between the subcostal and costal nervures ; the abdominal fold brown, or silvery grey ; the abdominal fringe light burnt-sienna red.

[Note : Even in the blue, violet, or orange forms of *Cræsus* or *Urvilliana*, the underside will always be green, or a strong greenish-blue, and the green may become so golden as to be virtually yellow in the proper light. The black spots and golden spots may vary from 0 to 7 each : may be very large, or very small ; the cell may become more or less black. In some ancient forms the row of black disc spots may have been united to the black margin, so as to constitute a broad black band occupying half the wing ; or the whole wing may have been entirely green on this surface.]

The thorax and abdomen vary little from the ideal pattern and colour, which is nearly that of *Priamus*.

♀. Anterior wings light brown ; the discoidal cell immaculate ; a broad band or system of discal light spots and marks, so arranged as to present the appearance of a double row of irregular-shaped spots or marks, whereof the 3 uppermost are the longest and largest, these occupy more or less of the whole middle of the disc ; no marginal band ; white fringe lunules.

[Note : This band may be broken up in every conceivable manner into large or small spots, varying in number from 2 or 3 to 14, 15, or (rarely) 16 ; even in the acraeoid ♀ of *Lydius* they are only 17 ; their form and size may be an elongate-longitudinal, cuneiform, lunate, square, or rudimentary ; or the whole band may be absent, and the wing quite brown all over ; the cell may have one white mark or patch occupying only a small portion, or the greater part of the cell, and it may be either sub-tetrahedral, oblique, or exceedingly irregular in shape ; it may be divided into 2, 3, 4, or 5 parts ; any one of these parts may be absent, or 2, 3 or 4 of them may be obliterated in one specimen, and the remaining divisions may be at any part of the ideal patch : the division may also be rudimentary, *i.e.*, composed of minute scales, or half-and-half. An *Ornithoptera* may yet be found with the upper wing nearly entirely white : but this is not very probable ; yet the cell of *Lydius* is almost entirely white.]

Under surface of anterior wing : the white discal band broken up in the same manner as above, but the inner with marks or divisions are longer, larger, and more hastate ; the cell immaculate ; no marginal band.

[Exactly the same may be said of the marks in their variation, including *Lydius*, as above, except that the cell mark is generally more irregularly shaped and rugged than on the upper surface.]

Posterior wings, dark brown ; a broad discal band of independent hastate light marks, each with a suborbicular black or brown spot, pupilled faintly with a smaller and blacker round spot ; the portion of the light marks below the brown spot warm brown, the margin of the wing darker.

[Note : This light band may be very much reduced, partly rudimentary, or obsolete ; or extended so as to occupy nearly the whole wing ; it may be also continuous except for the veins ; the black spots may be deep black ; very large or very small ; and the marginal band black ; the light band may be ochraceous below the orbicular spots, or orange, and the band vary from white and cream-colour to ochraceous.]

Underside of posterior wings, subject to the same rules as above, and the pattern similar.

[The colour of all light marks may vary from creamy-yellow to a rich orange-yellow.]

Thorax black with a green longitudinal mark ; abdomen ochraceous grey, orange beneath.

[Note. No great amount of variation is found in the colour and markings of the body. Except in the case of *Lydius*, the discoidal cell is always entirely brown. The wings of all ♀ ♀ may be any depth of brown from light ochraceous brown, to a very deep melanism above and below.]

At the end of this volume, in the article treating of the geographical distribution of the Ornithoptera, the author has endeavoured to convey some idea of the physical conditions of the countries where the species are found. These are naturally very brief and imperfect ; but it appeared to him that in all treatment of such a subject as the geographical distribution of any group of creatures, the more completely the physical and other features of the countries are understood, the more likely are many of the zoological problems of the animal world to be ultimately solved ; while much light may possibly be thrown upon the subject of which this work treats, even as concerns its more simple points of enquiry.

While the author has in their proper places acknowledged his indebtedness to all who have lent him examples of species for study or figuring in this work, he feels especially glad to again acknowledge the assistance he has received by the use of the many splendid examples contained in the wonderful collections of the Hon. Walter Rothschild and Mr. H. Grose-Smith—to which he has generally had access as freely as if they had been his own. The value of this privilege may be estimated, when it is stated that Mr. Grose-Smith's collection is a singularly rich one, in *Rhopalocera*—that in the 1500 to 1800 drawers in which his lepidoptera are contained there are representatives of

almost all the Ornithoptera, and good series of many of them, almost every specimen being in the finest condition. Of Mr. Rothschild's collection, in his Tring museum, it is safe to say that in no other part of the world is there such a vast collection of Lepidoptera, especially of the Eastern Papilionidæ: that among the Ornithoptera is to be found nearly every known form—and often in such immense series, and representing so many localities, that it may be considered that in this museum alone the materials for any amount of research may be obtained. The Ornithoptera occupy several big cabinets; and the Papilionidæ are contained in one large and high room, arranged in 36 big cabinets of 40 drawers each, or 1,440 drawers in all. But the remainder of the Rhopalocerous and Heterocerous Lepidoptera, which is then only a small section of the contents of the Tring Museum, may be numbered by hundreds of thousands of specimens. These and other collections are always receiving augmentation, and are rendered all the more useful by the almost regal library, treating of so many of the Zoological and Biological subjects for which the museum is famous.

Finally, the author cannot refrain from expressing his deep admiration and joy in the contemplation of these and the multitudinous works of our holy and glorious God and Creator. The lovely things treated of in this work are but as the smallest portion of the great order to which they belong. A panoramic view of the butterflies and moths of this world would be one long vision of beauty in form, variety of pattern, and delicacy or splendor of colour, illustrated by tens of thousands of species ranging in size from a few millimetres in expanse, to ten or eleven or even more, inches; their patterns simple in the extreme, or so intricate and complex as to bewilder the eye; so varied and wonderful in colour as to include every imaginable tint from black or white to dazzling crimson, scarlet, blue, green, pearl, silver and gold; with markings sometimes resplendent with apparently pure gold, silver, copper, or aluminium, and the colour and flashing of all precious stones—prismatic, silky, velvety, diaphanous, quite transparent, intensely white, or intensely black, or ivory-like; with colour reflections in the most unexpected places; with changes of colour according to position of so wonderful and startling a character as to be fairly amazing; there are combinations of colour hardly dreamed of by the artist, yet so beautifully harmonised as to create astonishment in any sensitive mind; these most wonderful keys of colour, metallic texture, and brilliancy, are not confined to the larger forms, but are just as commonly met with amongst the most minute; and with all this glory an extraordinary variation of structure of the legs, palpi, and antennæ, and of imitation or mimicry in the shape of the body, characters, or pattern of wings, and simulation of the appearance of very distantly related species, as well as of other objects and other orders of insects! Some or other of these glorious things are to be found living in all climes and at all altitudes, from far within the Arctic circle to the Equator, and from sea-level to 18,000 feet of mountain height! A truly royal Divine gift to the earth is this one order of animals alone! But the glory of it all is that we only begin to dream of the wealth of creative wonders and beauties as we contemplate these. There are the *Coleoptera*, often with even greater glories than are to be found among the *Lepidoptera*, and a diversity of shape and general structure almost absolutely inexhaustable; with varieties of life habits that are endless—some graceful in the extreme, others bizarre and almost monstrous in appearance, their horns, and armatures, and tusks, as strange in structure as those of deer, elks, rhinoceri, elephants, or any of the African horned vertebrates—these characters being generally confined, as in the vertebrates, to the male sex; some are covered with spikes, or look like thorns when at rest; others have long antennæ with brush-like appendages; some resemble winged seeds, or the flat seeds of certain plants; or they are spherical, tortoise-shaped, hispid, cylindrical, and a multitude of shapes beside; their shining wing cases (elytræ) are often more gorgeous and brilliant than gems or metals—some of the Lamellicornes look as if sculptured in polished brass that is lighted by electric light—and many of the Phytophaga when alive are like spheres of sunlight, or dazzling dewdrops in the early morning—as the author has seen them in the tropics; some are apparently small nuggets of gold, silver, copper, iron, or other metals (in the genus *Chlamys*), others are like gems—sapphires, rubies, emeralds; some, when viewed with the eye appear to be encrusted with emeralds, and under the microscope their wing cases look in parts like mountains and valleys of precious stones, heightened in beauty by the art of the lapidary; some at night have points behind the eyes blazing with phosphorescent light; others, as they fly, look like a waving mass of fire-flakes,—as the author has seen them among the dark, feathery palm trees on a moonlight night in New Granada; and yet others seem to emit fire from every joint of the armour encasing the under side of their bodies. Beetles are so subject to mimicry among themselves, and mimicry of other objects and orders of insects, that we continually meet with the strangest examples of this phenomenon. Some are so small as to be scarcely visible to the eye; others so large that a pair of them would require to be accommodated with a fairly good-sized box; they are found in every land, and every position in and out of water: active in darkness and light—in manure, in flowers, in forests and on plains, under stones, in caves (and therefore blind), under the bark of trees, in the heart of timber, in ants' nests (and then shaped like ants); mimicking spiders in form, and probably with some of their habits; like long bits of stick among dead branches; flying in the air in clouds, or so few in individuals as to always remain rare; so numerous in species that more than 120,000 must have been described, besides thousands of species yet to be named, and multitudes of new species coming every year from various countries.

And so we may pass on from order to order of insect life, among the Orthoptera with their multitudinous strange forms of Hemipterous (or bug life), with species as gorgeous in colour and wonderful in shape as beetles; of locusts, often with huge upper gauzy and decorated wings, and splendidly coloured under wings, which in a state of rest are folded like the leaves of a fan, and concealed beneath the upper ones; or the many species of *Mantis*, with their hypocritical-looking attitude; or the walking-stick insects, some of them 24 inches long, and most like a lot of brown, or mossy, or lichenous twigs arranged in the form of an insect, and the other curious manifestations of the *Phasmidæ*, or phantom-like insects, or the still more remarkable leaf insects, of which there are many species. All through this great order we meet with wonder upon wonder! and so we do in every other order, whether as regards form, function, size, or colour.

But should we depart from the insect world and review either the other Arthropods, or indeed any of the Invertebrate orders ranging from spiders through the almost endless armies of other creatures, down to the diaphanous Medusæ of the ocean we shall experience the same overwhelming sense of the vast array of creatures often strange and beautiful in colour and decoration with which this earth is peopled. We should review the spider tribes, with species most tiny and species as

large as birds ; ferocious in aspect, or gorgeous in colour and markings, some banded with pearl or silver ; or with delicate patterns traced on their bodies in gold, crimson, or scarlet on a green or a brown ground. There would be the Mollusca with their glorious shells—painted in all tints of colour—adorned with wonderful surface designs moulded in classic shapes, with many of them strangely spined, such as are some of the *Muricidæ*, *Cardiums*, *Veneridæ*, *Chamas*, or *Spondylæ* ; the cylindric and pupæform *clausilias* and other genera, the lovely *Bulimi* and *Helices*, the rich *Volutes*, *Cones*, and *Cyprias*, the gorgeous *Trocha*, *Haliotidæ*, and *Tellinæ*, and the numerous *Unios* with their pearly or silvery interiors ! Then descending lower still to the world of semi-invisible creatures, such as the *Radiolaria*, *Polycystina*, *Diatoms*, and *Rhizopods*, to say nothing of others lower down still, so small, yet so complex and beautiful in their silicious homes and shells, or so simple in their organisation, till we seem to be entering within the portals of the infinitely little,—where species even of the *Radiolaria*, more astounding in form and complex sculpture than anything among the higher groups of creatures come to our notice in such multitudes of species that Hækel describes in one of the 48 huge vols. of the Challenger Report between 4,000 and 5,000 of them, not half of those known to exist—with the additional wonder that however complex the sculpturing and pattern of each species is, it is all executed within the space of a minute point that seems to have no dimension at all !

We may truly and reverently say that all God's works are fearfully and wonderfully made ! and we may add that God sends out all His creatures well and beautifully dressed, and also efficiently armed for the warfare of its life. This is exemplified through all the Vertebrate and Invertebrate creatures of this globe, from the fearful beauty of the Reptilia, and the graceful beauty of the countless species of Rodents and Birds, till we reach those magnificent members of the great Cat family—the tigers, leopards, and other big beasts of prey. No living mind can sum up all the Creator's works which people and adorn the beautiful world in which we live. Ages of investigation are needed for such a task as this ; and then perchance new creations would be in progress.

Yes, and then ? and then ?—there is infinity—space with its worlds and suns visible to the telescopic and photographic eyes, to be counted by millions without limit—system beyond system, universe beyond universe, above, below us, and in every direction of space, east, west, north, or south, stretching away on the pathways of infinitude for ever and for ever, without beginning or end ! But is this all ? No ! a thousand times, no ! For then even, we may be sure that while this is only the visible or material universe, there is an unseen—a spiritual universe, which is still more vast, more wonderful, more complex, and more glorious ! Aye, and a boundless universe of *Intelligence* more wonderful and beautiful than all ; while every being, every mind, every force, and every manifestation is subject for ever and ever to the ineffably holy, wise, lovely, and awful power and will of the Triune Love—the being whom we call God, who is the author of all, and who reigns over all.

And here we must rest, with the joy in our adoring hearts expressed by those words of the Psalmist David : “ Many, O Lord my God, are Thy wonderful works which Thou hast made, and Thy thoughts which are to us-ward ; they cannot be reckoned up in order unto Thee : if I would declare and speak of them, they are more than can be numbered.”* Yet “ We will speak of the glorious honour of Thy Majesty, and of Thy wondrous work.”† And “ All Thy works shall praise Thee, O Lord ; and Thy saints shall bless Thee.”‡

*Psalm xl., 5. †Psalm cxlv., 5. ‡Ps. cxlv., 10. David, or the Author of the 148th, 149th, and 150th Psalms might well call upon everything in creation to praise the Lord ! The sublime words of these ancient Israelitish Hymns come to us now as the fitting expression of a mind overwhelmed with the contemplation of the radiant glory of the King of Kings in the endless manifestations of His thoughts in Nature, History, and Providence !

EXPLANATION OF THE EXTERNAL ANATOMICAL CHARACTERS OF THE ORNITHOPTERA ON PLATE I.

FIG. I. NEURATION OF WINGS. ♀.

A. Primary, Superior, Anterior or Upper Wing.*

- c., or A. M.—The Costa, or anterior margin.
 cn. Costal nervure.
 sc. Subcostal nervure.
 sc. n. 1, 2, 3, 4, 5. Subcostal nervules. [The median nervure is 4-branched in the true Papilionidæ, which include all the genera from *Mesapia* to *Leptocircus*; but this arrangement is not met with even in its sub-family Pierinæ.
 d. 1, 2. Discoidal nervules. [The 2nd discoidal nervule should really be considered as the 1st median nervule; in which case the 1st median n. would be counted as the 2nd, and so forth.]
 m. Median Nervure.
 mn. 1, 2, 3. Median nervules.
 sm. Submedian nervure.
 i. Internal nervure.
 dc. n., 1, 2, 3. Disco-cellular nervules.
 im. n. Interno-median nervule.
 dc. c. Discoidal cell.
 B. The base of the wing.
 a. or aa. The apex, or anterior angle.
 P. or H.M.—The posterior or hind margin.
 P. or AA. Posterior or anal angle.
 I. or I. M. Interior or inner margin.
 Ps-n. 1, 2, 3, 4. Pseudoneura.
 Sm. f. or Sm. p. Submedian fold or Pseudoneurus.
 w. f. Wing folds.

B. Secondary, Posterior, Inferior, or Hing Wings.†

- cn. Costal nervure.
 s. c. Subcostal nervure.
 sc. 1, 2. Subcostal nervules.
 dc. n. 1, 2. Discocellular nervules.
 m. Median nervure.
 d. Discoidal nervule.
 mn. 1, 2, 3. Median nervules.
 sm. Submedian nervure.
 p. Precostal nervure.
 A. or AA.—Apex or anterior angle.
 C. or A.M.—Costa, or anterior margin.
 dc. Discoidal cell.
 P. or H. M. Posterior, or hind margin.
 A.M. or I.M. Abdominal or inner margin.
 An. A. Anal Angle.
 Af. Abdominal fold.
 B. Base of wing.
 Ps. n. 1, 2. Pseudoneura.

FIG. II. THE THORAX OF THE ♀.

- ri. Prothorax; 1a. Patagia or Tippets.
 r. 2. Mesothorax. 2a. Tegule, Pterygodes, or Paraptera; Vit., green longitudinal vitta; Sc. Scutellum.
 r. 3. Metathorax; pr., the Præscutum; sct., the Scutum; sc., the Scutellum.

FIG. III. THE THORAX OF THE ♂.

- r. 2. Mesothorax; Vit., green longitudinal vitta; sc., the Scutellum.
 r. 3. pr., the Præscutum; sc., Scutum; sct., Scutellum.

FIG. IV. THE ABDOMEN. ♀.

- s. 1, 2, 3, 4, 5, 6, 7 (on right-hand side of fig.), segments or annulations; on left-hand side of fig. 1? 2? 3? 4? 5? 6? 7? 8? the same by a questionable notation; 6 f., segmental fold, or false segment.

FIG. V. THE ABDOMEN. ♂.

- s. 1, 2, 3, 4, 5, 6, 7, 8, segments or annulations; on left-hand side, 1? 2? 3? 4? 5? 6? 7? 8? 9? the same by a doubtful notation.

- av. Anal valve; ce. caudal or anal extremity.

FIG. VI. av. Anal valves of the ♂ magnified.

FIG. VII. Caudal extremity of the ♀ magnified.

FIG. VIII. The abdomen of the ♂: lateral view, with the annulations numbered by two notations as above.

FIG. IX. The abdomen of the ♀ treated in the same manner; ce., anal extremity, and t., anal tuft.

FIG. X. THE HEAD, ♂; e., the eye; ant., antennæ; l.p., labial palpi.

FIG. XI. The head, ♂, lateral view; ant., antennæ; l.p., labial palpi; e., the eye, with posterior light margin.

FIG. XII. Front view of head of the ♀.

FIG. XIII. THE HAUSTELLUM, ANTILIA, or SPIRITROMPE, of the ♂.

- BA. Folded. BA.1. Unfolded. BA.2. Magnified section (when closed).

FIG. XIV. Labial palpus of ♂ greatly magnified.

- FIG. XV. A. Prothoracic section of thorax (♂) lateral extension; A.1., shewing the groove in which the femur of the anterior leg rests; A.2., dorsal extension of prothorax (synonymous with the collar [see fig. 2. RI.]) Fig. 15. B., mesothoracic section; B.1., groove in which the femur of the 2nd pair of legs rests; B.2., spiracle, or breathing organ, generally covered with a scarlet tuft of hairs; B.3., dorsal portion of metathoracic; B.4., veins of anterior wing. Fig. 15. C. Mesothoracic section; C.1., groove for femur; C.2., base of wing; C.3., outline with veins of posterior wing.

FIG. XVI. THE LEGS. ♂.

- x. 1st or Prothoracic leg. a. The coxa; b. Trochanter; c. Femur; d. Tibia; e. Spur on tibia (only found on 1st pair of legs); f. 1, 2, 3, 4, 5. Tarsi; g. Ungues or claws.
 xx. 2nd or Mesothoracic leg. [Sections numbered in same manner.]
 xxx. 3rd or Metathoracic leg. [Sections numbered in same manner.]
 Each fig. shows the attachment of the leg to its respective Thoracic section.
 xxxxa. A greatly magnified figure of tarsi, f. 4, f. 5, with front view of unguis or claws (g). xxxxb. Lateral view of unguis (g).

FIG. XVII. teg. u. s. Underside of the Tegula or Paraptera of the ♂.

* There are 19 veins on this wing: viz., 5 nervures, and 14 nervules or branches of these.

† There are 13 veins on this wing, viz., 5 nervures, and 8 nervules or branches of these.

OBSERVATIONS ON SOME OF THE FOREGOING FIGURES.

Fig. 1.—On comparison a considerable difference obtains in the outlines and character of the neururation of the different genera of the great family of Papilionidæ. In our Fig. of Ornithoptera, drawn from the ♀ as being the most useful for the purpose, attention may be called to the 3 accepted branches of the median vein on the anterior wing,—their direction being normal in the ♀, while in the ♂, as shown in another place, they are considerably distorted or diverted in their course by passing through the disturbing medium of the stigma or sexual brand. This effect is necessarily produced on both surfaces, because the brand is impressed on the two membranes of the wing: and throughout the whole of the species or forms of the true genus ORNITHOPTERA among the ♂ there is no exception to this rule. It will also be observed that the wing outlines of the female ORNITHOPTERA differ from those of the males so considerably in every species that if we were only just made acquainted with them, and each sex had been taken in a different district or island, we might have been disposed *prima facie* to regard them as members of two distinct genera. It may be observed that the males are always closely related in appearance and splendour, as if they were only local forms of one species, with the single exception of the Australian *Richmondia*, from the Richmond River: [even this species is as splendid as any of the others, but it is much smaller—appearing more like a dwarfed form of *O. Cassandra*;] and that the females also are generally much alike in dull colouring and marking, as well as size and outline, with one exception (that of *Lydius*) though varying so infinitely in minute details, that they also might well be regarded as local variations of a single form. The two sexes of the POMPEOPTERA, on the other hand, generally bear a close resemblance to each other both in outline and colouring, and even, with a few exceptions, in size,—the most notable being *P. Dohertyi*; there is no disturbance of the veinlets of the ♂ anterior wings, because the stigma is absent, and an abdominal marginal pouch, filled with *Androconia*, takes its place. By a natural gradation the South and Central American red and black, and green and black Papilios (or as I prefer to consider them, ORNITHOPTERINA, follow with a similar outline of upper, and sometimes a tailed posterior wing; but in no known case is the hind wing of ORNITHOPTERA, TROGONOPTERA, or POMPEOPTERA, thus prolonged. In TROGONOPTERA, like POMPEOPTERA, the form and appearance of the sexes are very similar, and the ♂ proves its close relationship to Pompeoptera by the abdominal fold or pouch, with its contents. The outline of the genus is not unlike that of *Druryia*, which we consider as the head of the group of the Ornithoptera, though the anterior wings of *D. antimachus* are more concave, we might say, almost falcate. DRURYIA (including the West African *O. Zalmoxis*), appears to differ but little in the wing outline of the sexes, except in size; and being Acræoid in superficial appearance, recalls to our attention

the Asiatic Papilios of the *Dissimilis* group. But the most remarkable of all Ornithoptera, not excepting even the ÆTHEOPTERA, is the genus SCHOENBERGIA. Here we have a tailed hind wing, almost suggestive of that of the genus *Leptocircus* (of Swainson), with a curious arrangement of the neururation to strengthen the modified parts, and a disproportion between the size and form of the anterior and posterior wings,—the body also being modelled on a modified plan. In an examination of the true Papilionidæ we meet with several interesting resemblances to the neururation of the ♂ *Schoenbergia*. The females of the latter genus are outlined like those of ORNITHOPTERA, and the neururation is closely like that of the ♀ ÆTHEOPTERA; the general appearance is something like that of ORNITHOPTERA, though darker and in an indefinable way considerably distinct; but it is very closely like the alleged ♀ of *Sch. Tithonus*,—while the general appearance of each, is unlike that of the species of ÆTHEOPTERA. Lastly the males of ÆTHEOPTERA possess a stigma or sexual brand, the 3 median veinlets are very close together and low down on the wing—are modified in direction by passing through the stigmatic surfaces—and the excised outline of the posterior wing is absolutely abnormal and curious; added to this the splendour of the insect is greater than that of any other known species or genus of Lepidoptera, not excepting even those of *Morpho*, *Callithea*, *Agrias*, or *Urania*. A review of other sections of the PAPILIONINÆ, with respect to their outlines and neururation, including the genera TEINOPALPUS, SERICINUS, ARMANDIA, THAIS, EURYADES, EURYCUS and LUEHDORFIA would yield much interesting and instructive material for comparison with the Ornithoptera. In all these genera it may be noticed that the precostal nervure is bifid, though the size and shape differ much in each genus; while in the genera DORITIS and HYPERMNESTRA this is not the case—a fact which seems to ally the latter to the sub-family PIERINÆ, though the median veins of the anterior wings are four-branched as in Ornithoptera and Papilio.

Fig. 2.—The Tegulæ or Paraptera are affixed at the base of the anterior wings on the upper side of the mesothorax, or second section of the thorax. In the Ornithoptera they are large and usually covered with black hairs; but in some Lepidoptera they are often of different colours from the rest of the Mesonotum, or with spots of two different colours as the case may be, as in the *Heliconia*, *Danainæ*, some of the Papilioninæ, and the Arctiidae among the moths,—the American arctiidae for example. In some genera they are obscure in outline, as in *Par-nassius*, some of the Geometridæ, and in other families; while they are very prominent and recognisable in the Arctiidae, the big Bombyces, some of the Geometridæ, and many butterflies; but their most obtrusive development is met with among the Noctuidæ, notably in the genus *Plusia*, where they raise the thorax into an absolute ridge near the head; and, as Westwood points out, in the

genus *Cucullia* "they are very large, and push forward the thorax, so as to form a sort of hood over the head." I may, however, add that in the latter case this elevation is really the result of the large size of the patagia or tippets which are placed at the sides of the pronotum, and are more prominent than in any other genus which I can call to mind at the present moment. In the genus *Xylina* the paraptera are elongated, and give the sides of the thorax an elevated appearance, with the centre depressed. But perhaps the most lovely and interesting modification of this character is to be met with in the European Angle-shades moth, *Phlogophora meticulosa*, where the Paraptera fold gracefully down the sides of the mesonotum in the usual way, with a triangular elevated mass of hairy scales with two greater lateral prominences, and a smaller one below on the metanotum. The patagia cover nearly the whole of the pronotum above, have a small central prominence, and are ornamented with delicate curved lines to look as if there were 6 patagia instead of two. These wing covers if viewed from their under surface (see fig. 17), appear to be very convex, and on the underside evidently possess a complex organism if we may judge by the multitudinous divisions of the thin membrane, and the cellular appearance under this membrane. It is evidently a highly organised scale, adhering to the base of the wing only by a very small portion of its surface; is thick and somewhat corneous, probably with more than one thin membrane beneath, or even several laminæ, and always clothed above with long hairs, which extend beyond the outline of the paraptera itself, often to a 5th or 4th of its length. The form of these organs is pretty constant in the Ornithoptera; but varies very much throughout the Lepidoptera; their office seems to be to cover the muscles and veins at the base of the wings, for decoration, and probably as a protection in some way to the breathing organs. The shape of this scale does not appear to differ materially in the two sexes.

We are indebted for the different names applied to these organs to the following authors: Pterygodes, *Latreille*; Paraptera, *MacLeay*; tegulæ, *Kirby and Spence*.

Fig. 4.—There would seem to be some uncertainty in the way different authors regard the number of the segments of the body or abdomen. In this fig. it will be seen that on the right side I reckon 7 segments, including the caudal or anal extremity. No. "6" and "6f." in the fig. only represent one segment, as "6f" is only a prominent fold of that segment. On the left hand side of the figure a small section at the base of the meta-thorax is hypothetically numbered "1?" and so on with the others down to "8?" but a careful examination of the part with the microscope appears to make it a continuation of the meta-thorax, coming just below the scutellum; though it probably is only a folded portion of what on the right side I call the 1st segment. In fig. 5, representing the ♂ abdomen, there are 8 annulations, including the anal segment: on the left hand side, they are numbered from "1?" to "9?". Here, by a reference to figs. 8 and 9, No. "1?" in each case appears to be a distinct segment; but it is by no means certain that they may not be a small portion of the meta-thorax. One thing is evident, the abdomen of the ♂ of ORNITHOPTERA consists apparently of one more segment than that of the ♀.

Figs. 10 and 11.—The shape of the parts of the face below the villose tuft of the head appears to differ somewhat in the two sexes; but the labial palpi are similar in form, though very different in the relative length of the

joints from those of other genera, especially in that of DRURYIA, PAPILIO, and SERECINUS. The Palpi are very short, and are entirely, or nearly entirely concealed by the dense mass of hairs, which partially also conceals the spiritrompe when in a state of rest.

Fig. 13.—The slender proboscis called by Latreille *Spirilrome*, or *Spirignatha*, (the latter name corrected by Westwood to *Speirignatha*), *Antilla* by Kirby and Spence, *Liagua* by Fabricius; and *Haustellum* by general authors is composed of two separate pieces, the analogues of the maxillæ or lower jaws of other orders of insects. These two sub-cylindrical tubes vary greatly in length in the different genera of the order. The junction of the two is effected by a series of minute ducts (*inoscula*) or hooks which link them together, thereby forming an intermediate or central tube, through which the juices of flowers or carrion, and the moisture of way-side pools, or the dew on vegetation is conveyed to the mouth. It has been supposed that the lateral tubes are for the reception of air, but this cannot be established. At the base of these a pair of relatively minute palpi is to be found (Fig. xiv.), which in the Papilionidæ are generally hidden beneath the hairy scales round the mouth. These spiral maxillæ are defended by a pair of longer palpi clothed with scales, which are situated on the lower lip. This beautiful organ is intended for the extraction of the nectar from the bottoms of flowers; and, when at rest, is spirally folded up, and nearly hidden. Its greatest development in length is probably among the Sphinx or Hawk moths. The magnified section (Fig. 13, BA.2) will give some idea of its structural beauty.

Figs. 15a, 15b, 15c.—Are an endeavour to give the true shape of each section of the thorax as seen laterally. It may be mentioned that the Prothoracic and Metathoracic sections are moveable, the mesothoracic being much the largest, and more rigid. It is possible to move the Prothorax as easily as the femur of the anterior leg—indeed in general appearance it is not unlike the femur, only rather broader. In each section the femur sinks into a groove when at rest, and in its normal position. The anterior wings are affixed at their base to the mesothorax, and beneath them in the space (B 2), is generally a mass of coccineous hairs, beneath which evidently are the spiracles or openings of the organs of respiration, which as we know, ramify through the whole of the organisation on a dendritic plan. The posterior wings are also attached at their base to the metathoracic section (Fig. 15c). As in all insects each pair of legs is affixed to its respective section of the thorax; the first and second pair being nearer together, and the third pair further removed.

Fig. 16.—Represents the legs of the typical Ornithoptera. Very slight differences may occur between those of the ♂ and ♀; somewhat greater obtain between those of different genera, as may be observed by reference to other plates in this work, especially in the character and relative lengths of the tarsi of the anterior legs. The ungues or tarsal claws are in DRURYIA longer than in ORNITHOPTERA, or something like those of PAPILIO, though more like ORNITHOPTERA in the form of the base. But as a matter of fact the form of the ungues varies consider-

*This segment of the thorax is usually the largest and most highly developed as well as complex of the three in all orders of the Insecta; but it attains its greatest size in the order of the Diptera, where it forms the principal part of the thorax. The reason for this can be readily understood when we consider that to the mesothorax are attached the 2nd pair of legs, and the pair of anterior wings.

ably throughout all the genera of the Papilioninæ, and indeed throughout the whole order. The legs, consisting of the 5 chief divisions, are each united to the sternum of their respective Thoracic segment by the coxa, which articulates with the sternum, the form being variable in the different insects, and even among the various divisions of the lepidoptera. The tibia, which is generally equal to the length of the femur, is often, but not always, armed with a pair of spines or spurs, at its junction with the tarsus. In the Ornithoptera these appendages are sometimes absent from the anterior legs, which, however, always possess a thickened spine, or hollow cone midway affixed to its underside. All the divisions of the tarsus at their articulation possess a pair of spines slightly longer

than the numerous spiny hairs that fringe the entire length of the tarsus, and more sparingly (in rows), of the tibia. The divisions of the leg may be reckoned as ten in number, including the ungues (see fig. 16, xxx, A—G).

Fig. 17.—The antennæ generally possess from 44 or 46 to 50 and 52 articulations, ranging from the scapus (or the 1st and most conspicuous joint, which is implanted in its torulus, a cavity of the head between the eyes, and close to the eye) to the more thickened apex. But in ORNITHOPTERA, as in the diurnal and many of the heterocerous lepidoptera these articulations are not flexible; though the antennæ are always more or less curved, especially outside of the Nymphalidæ.

GROUP I.



THE ACRÆOID ORNITHOPTERA.

Genus DRURYA.

Drurya, (described as a Section of Papilio) Aurivillius, "Fjärilar från Gaboon," in the Ent. Tidskrift, p. 44. (Stockholm, 1880).

" Fickert, (characters noticed) Zool. Jahrb. Abth. f. Syst. iv., p. 692.

" Staudinger and Schatz, Exotic Schmetterlinge: Die Fam. und. Gatt. der Tagfalter, text, p. 22., p. 40. Theil 2 (1892).

♂. Antennæ of moderate length, and rather more obtuse at their summit than in Papilio.

Anterior wings: costa much elongated, and sufficiently convex or arched in *Antimachus*—less long and a little more convex in *Zalmoxis*; exterior margin strongly concave from the terminal of the 1st discoidal branch; the apical angle much rounded and very obtuse; interior margin nearly a straight line, and incurved towards the base in *Antimachus*; very concave, and less incurved at the base in *Zalmoxis*; anal angle slightly rounded. The costal vein is stout and strong: the subcostal from the base is so close to the costal as to appear united with it; and the 1st and 2nd branches of the latter are equally close together nearly along their entire length; the 3rd branch curves downwards at the apical angle: the 4th and 5th branches bifurcate at a considerable distance from the 1st discocellular nervule; all the branches of the median vein are æqui-distant from each other, the first 3 curved irregularly downward at the margin, and the 4th upward; the median nervure is fairly stout and strong, especially in *Zalmoxis*; the submedian nervure is stout, and very concave for a short distance from the base, then more straight to the posterior angle (the convex curvature of the corresponding portion of the interior margin strongly emphasizes the width of space thereby obtained between the vein and the margin in *Antimachus*.) The interno-median nervure is stout and long, and united as a branch to the submedian [in some Papilios the two appear to be absolutely independent except at the extreme base; the pseudoneura are obscure, but their position will be seen by reference to Plate II, fig. 5, and Pl. III, fig. 3]; discoidal cell long and narrow.

Posterior wings small in proportion to the anterior in *Antimachus* (but normal in *Zalmoxis*); rounded, with the costal margin entirely straight—the basal portion with so strong a curvature as to render the wing above the precostal nervure extremely convex in *Antimachus*—less straight in *Zalmoxis*; from the apical to the anal angles the hind margin is rounded, and more or less strongly denticulated in *Antimachus*; in *Zalmoxis* there is a gradual curvature from the costal margin to the anal angle (the apical being lost), and the hind margin is only slightly scalloped; the inner margin in each species has the normal, almost straight line; all the veins well expressed—the subcostal, median, and submedian nervures

fairly robust, especially in *Antimachus*,—the distance between each nervule being generally nearly equal. The bifid precostal nervure encloses an almost diagonal cell greater than in most of the Ornithoptera, and greatest in *Zalmoxis*; the discoidal cell shorter, broader, and more unequal in width than on the upper wing, especially in *Zalmoxis*, as the 2nd division of the subcostal vein is strongly incurved just beyond its 1st branch; the pseudoneurus is very strongly expressed in *Zalmoxis*, and starts as a short stem at the base of the cell, then branches off, the 2nd and 3rd branches to the entire length of the cell, the 1st being only a few millimetres long; in *Antimachus* the pseudoneurus runs from the base of the cell nearly half way, when it branches off,—the first branch short, and terminating nearly midway of the 2nd division of the subcostal nervures,—the 2nd reaching the 2nd discocellular nervule, with a short (or 3rd) branchlet in some specimens near to the end of the cell.

Head broader in *Zalmoxis* than in *Antimachus*, palpi very short, and hidden by the rather long pointed, and prominent tuft of hairs in *Antimachus*—less pointed and obtusive in *Zalmoxis*; haustellum partially concealed by tuft of hairs in *Antimachus*, less so in *Zalmoxis*; eyes rather smaller in *Antimachus* than in other genera; thorax about normal in size and form; legs, with their femora more equal in length than in some genera.

Abdomen long and graceful in *Antimachus*, shorter and rather stouter in *Zalmoxis*; anal valves smaller in proportion than in other Genera.

♀. [*Antimachus*] Considerably smaller than the ♂. Anterior wings with costa slightly straighter than in the ♂, and posterior margin less concave; in all other respects the same as in the ♂. Posterior wings similar in character to those of the ♂. Head and thorax similar to ♂. Abdomen shorter, more robust, less graceful; anal segment obtuse, and anal tuft inconsiderable.

Type of the Genus, *O. Antimachus*. [It may be necessary some day to regard *Zalmoxis* as the type of a subgenus.]

The general appearance of both sexes, but especially of the ♀ of *Antimachus*, is that of an abnormally large *Acræa*.

DRURYA ANTIMACHUS.

Papilio Antimachus ♂, Drury, Illustr. Exot. Ent., III. t. 1 (1782).

- " " Esper, Ausl. Schm., t. 22, f. 2 (1785-98).
- " " Fabricius, Entom. Syst. Tome III., part 1, p. 11, n. 31 (1793).
- " " Godt. Ency. Méth. IX., p. 28, n. 8 (1819).
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- " " Westwood, Edition of Drury's "Ill. Exot. Ent." Vol. III., page 1, plate I. (1837).
- " " Chenu, Ency. d'Hist. Nat. Papillons, I., p. 38, pl. 15 (1855-67).
- " " W. F. Kirby, Syn. Cat. Diur. Lep., p. 530, (1871).
- " " Rutherford, Ent. Monthly Mag. Vol. XV. p. 5; and Ent. Monthly Mag. V. 3 (New Series), p. 162 (1892).
- " " W. F. Kirby, Text Book of Ent. p. 160, pl. 53 (from Chenu, 1st Edit. (1885); 2nd Edit. (1892).

Drurya Antimachus, ♂, Aurivillius, Fjärilar från Gaboon, p. 44 (in the Ent. Tidskrift), (1880).

" " Staudinger and Schatz, Exotische Schm., pl. XIII. (1888). Also Schatz, Die Fam. und Gatt. der Tagfalter, p. 22 and p. 40, Pl. II., fig. 1, a, b, (1892).

" " Fickert, Ueber die Zeichn. der Gatt. Orn., p. 692, also p. 755.

Drurya Antimachus ♀. Watkins, (brief description by) Ent. Mon. Mag. V. 3, (N. S.) p. 162; and Pl. V., with neurulation of Ant. Wing (internal nervure omitted), and figs. of ♂ and ♀ Anal Terminals (1892).

This magnificent species, so singularly acraeoid in its appearance, especially in the ♀, is evidently entitled to stand at the head of the Ornithoptera, and with *Zalmoxis* to which it is very closely allied, must represent the 1st of the three great groups of the Ornithoptera, the 2nd containing all the genera and species hitherto acknowledged to be Ornithoptera, and the 3rd including the whole of the rich series of the red and black papilios of South and Central America, which should be called ORNITHOPTERINA. In Kirby's Syn. Cat. Lep. *Antimachus* is placed directly after *Brookiana*, and before *P. Ridleyanus*, White; and it had till recently been regarded as occupying its proper position as a link between the Ornithoptera and Papilios. But a careful consideration of the characters of the Genera Pompeoptera and *Drurya* should convince us that they are not nearly related, while *Drurya* has little in common with the Ornithoptera; and if *D. Antimachus* is to be regarded as a true Papilio, it ought to be placed *after* the Ornithoptera and not before them. But in such a supposititious arrangement it would be found that the abdomen was unlike those of Papilio in character and colour, though it absolutely agrees in the latter particular with the genus Ornithoptera. Indeed, as may be seen by reference to the generic diagnosis at the head of this article, the anal valves of the ♂ are much more like those of Ornithoptera than of Papilio, though they differ in size and shape from each. The yellow colour of the abdomen, which is found in the true Ornithoptera, is never met with so entirely in Papilio. But more important still, while all the true Ornithoptera in the ♂ sex, with the exception of those in the Genus *Schoenbergia*, are furnished with a stigmatic brand, or an abdominal fold or pouch containing androconia—(the latter character being continued through the Ornithoptera,) in *DRURYA* these characters are not found, and it seems impossible to discover any traces of the so-called scent glands. The latter facts, if taken alone, would give these genera a place among some of the more advanced Papilios, but, considered with the characters mentioned above, they at once fall into their true position as placed in this work. It may be remarked here that some of the true Papilios, such as *Ulysses* and others, possess a male brand on the anterior wings, which is most like that of the genus Ornithoptera, though very different in shape; while

a curious patch of a similar nature is found near the base, on the subcosta of the posterior wings of several of the *Pierinae*; and a costal fold containing *androconia* on the anterior wings of several of the *Hesperiidae*, and also in the same position in some *Lycenidae*.

So evidently did *Antimachus* seem to demand for itself a position distinct from Papilio that Aurivillius, in 1880, made it the type of a new genus dedicated to the memory of its original describer, Drury, and it soon found its position almost or quite at the head of the Papilioninae, all the Genera from *Tienopalpus* to *Leptocircus* being placed after, instead of before, the Ornithoptera and Papilios—the wisdom of this sweeping change being justly subject to criticism.

This species was first described by Drury from a single example of the ♂, brought from Sierra Leone by Mr. Smeathman in 1775. It appears that Drury's Insects were sold in 1805, and it was then that Macleay purchased the specimen (at that time absolutely unique), which is supposed to have subsequently found its way to the Sidney Museum in Australia. In 1864 a second specimen was brought to England, having been taken by Miss Dibbol, a missionary at Creek Town, Old Calabar. A few years later Mr. Rogers (who was collecting for the late W. C. Hewitson on the Gaboon), took a specimen of the ♂, after 3 days' watching for it, and a little later on a second example. These are in the Hewitson Collection, now in the British Museum. About the same time Mr. Chapman of Glasgow, found a fine specimen among the contents of a couple of boxes brought home by his friend the captain of an African trading vessel, from the Gaboon. The expanse of this example was 9 $\frac{1}{4}$ inches. A smaller specimen, 8 $\frac{1}{2}$ ths inches, was next taken by the Rev. T. W. Thompson, of the Baptist Mission Settlement at Amba Bay, North of the Cameroons, and another North of Sherboro' River; these are in the Horniman Museum. Not long after Mr H. Grose-Smith's examples came from the Gaboon. Since that time numerous examples of the ♂ have arrived from the Congo; and in the Museum of the Hon. W. Rothschild is a full drawer, containing a perfectly magnificent series of the ♂, in splendid condition, and a fine example of the ♀. From the latter, and two of the noblest of the ♂ I have

drawn the figs. in the plates devoted to this species, and have newly and fully characterised the Genus.

The following is Drury's description of this species so far as the ♂ is concerned: to which I add some notes in brackets.

"Antennæ brown, and knobbed at their extremity. Head black, with 8 light spots on the top, almost white.

"Thorax black, with 4 white spots at the roots of the superior wings."

[The first 2 spots of the head are in front of the eyes over the palpi, and are light orange in some examples; the 2nd pair, buff white, are on the *torulæ* at the base of the antennæ; the 3rd and 4th pairs are on the pronotal collar; of the 4 on the mesothorax, two are situated at the summit of the tegulæ. All these are usually buff white.]

"Abdomen black next the body and at the top, but clay-coloured on the sides and extremity.

"Upper wings black next the body, but at the extremities more of a brown colour, with 18 different shaped marks and spots; some being angular, others oval, like crescents, &c.; those next the body are of a dark orange, the others of a yellow clay colour, some being so faint as to be hardly discernible."

[We may describe these markings in another way. Within the cell which is a dark orange red, are two broad transverse fascia, one of which is sometimes quite surrounded by the orange red; these are at the distal end; immediately outside of the median vein are 4 marks of the same colour, one very small, the others large and variously formed; close outside the 1st and 2nd discocellular nervules are two moderately-sized lighter marks, the lowest being the longest; between the 2nd and 3rd subcostal branches is a light space; a rather large light coloured mark between the 3rd and 4th; a large suboval light orange mark between the 5th and 1st discoidal, and another between the 1st and 2nd discoidal nervules, followed by 4 large variously shaped arrow-headed or sub-crescentic orange marks in the other veinal spaces till the inner marginal area is reached, which contains two long bars of orange only narrowly separated from each other—the one nearest the base being the broadest and longest; outside this band of marks are 8 narrow streaks of pale orange, of various lengths, situated on the disc from the 3rd subcostal to the 2nd discoidal nervules; these are really separated by the folds and nervules of the wing. In some examples they are very faint, in others quite absent. [See Plate II., fig. 1, and pl. III., fig. 1. The hind margin has also 4 light fringe lunules.]

"The inferior wings are a little dentated, the inner scollops being edged with clay-coloured (buff) crescents; these wings next the body are of a dark orange; the remainder clay colour, with a broad black border running round each wing, from the upper corner to the abdominal ones; the inner sides being deeply indented, and the outer ones scolloped, with 8 roundish black spots near the middle of each wing, one of which is supposed to be hid in the figure."

[Of these spots 7 are on the disc, and one within the cell close to the discocellular nervules, and extending

slightly outside of them; the size of all these spots varies much in different examples, those on the subcostal and abdominal margins, and within the cell being generally the largest—the two nearest the abdomen also more or less densely darkened by long dark brown hairs, which flow from the base over the cell and the inner portions of the wing: the subcostal space from the base to the black spot is always more or less darkened by black scales and black hairs.]

"Underside. Eyes dark brown; head black, with 2 white spots in the front. It has no palpi, [the palpi are very small and hidden, see pl. III, fig. 4.] The breast and sides black, spotted with yellow. [There are about 18 of these spots, some of them partially hidden by the legs.] Abdomen clay colour." [The abdomen is buff yellow, with a dorsal longitudinal dark stripe.] "The middle of superior wings has a black patch, on which are 3 orange coloured spots, answering to 3 on the upper side; a long angular dark orange mark joins the anterior edge next the body, close to which are 2 roundish black spots. The extreme points of these wings are of a dark greyish ash colour, the ribs being black."

[The basal half of the discoidal cell is orange red, followed by a light ochraceous-grey and a pale buff area, on which are 2 black marks, answering nearly to those on the upper surface; the 4 pale ochraceous-grey marks outside the median vein answer to those above; the 4 light buff marks outside the 1st and 2nd discocellular nervules answer to 4 above, but are larger, and separated by less black; the lighter areas above these correspond with those above; the 3 orange and buff submarginal marks correspond with those on the upper surface, but are larger, reaching nearly to the fringe lunules, but with very little black between them; all the remainder of the wing on its upper portion is a dark graduated buff, with the fold-rays and veins very broad and dark; the costa from the base is buff yellow; the inner marginal light orange marks are similar in position to those above, and the wing has at least 5 fairly distinct fringe lunules or crescents. The ochraceous grey areas are dusted with dark scales.]

"The inferior wings are clay [buff] coloured, with 8 black spots, answering to those on the upper side; the black border being narrower on this side, and the inner edge much deeper indented. All the wings are dentated."

[There are 6 large marginal lunules, and the inner dentations of the border are long and graceful. (See pl. II., fig. 2). The Pseudoneura in the cell are well exhibited in black, as are the precostal, and basal portions of the veins. On the upper side of the anterior wings the folds are prominent with dark rays seen throughout the almost semi-diaphanous membranes.]

The Coxa, trochanter and femur of the legs are orange yellow, the tibia and tarsus black.

It should be borne in mind that the descriptions are only strictly accurate for Drury's examples and the figs. on my plate II. A reference to the 2nd plate will show a great difference; and every example varies in many particulars from all others. Hab. of ♂ in Pl. II, Ogowe River, W. Africa; of ♂ in Pl. III, Bopoto, Congo River W. Africa.

Costa of ♂ figured on Pl. II, 117 mms. (or 8½ths

inches for the entire expanse of the wings including the width of the thorax.) Greatest width of anterior wing 40, least width 9 at the base, and 29 mms. at 2-3rds of the wing length from the base; length of hind wing 57, and width 40 mms.; length of thorax with head 21, of abdomen 33, and of antennæ 23 mms.

Length of legs: } 1st pair: femur 11; tibia 9; tarsi, 9 mms.
 2nd " " 13; " 12; " 10 "
 3rd " " 11; " 13; " 10 "

Articulations of Antennæ about 40.

Length of costa of example figured on Pl. III., 104 mms.

In the museum of The Hon. W. Rothschild.

Drury's figure of this species was drawn by Moses Harris; but a more successful one had previously been made from the same example by Donovan's artist, Jones. From these all the drawings in the works quoted at the head of this article were copied.

♀. The following descriptive note by Mr. W. Watkins was published in the Ent. Monthly Magazine in 1892:

"Fore wings rounded on outer margin instead of concave. Also much less clothed with scales, and approach a semi-diaphanous condition. Anal segment exactly the same as in Ornithoptera, the ♂'s having a horny clasping terminal, whilst the ♀ is simple and thickly pubescent. In the collection, with a dark ♂ taken at the same time, of Herbert J. Adams, F.E.S., England, "Hab. Gaboon."

In the example which I have figured on Plate II. of this work the ♀ is much smaller than the ♂, though I have seen a ♂ nearly as small; the posterior margin is somewhat concave; on the upper surface the pattern of the posterior wing is nearly a repetition of that in the ♂; the

marks and colours of the anterior wing are relatively in the same position, and of the same colour, though generally differing more or less in shape; the wing is also almost semi-diaphanous, giving it a slightly greasy appearance in some positions of light; the markings on the underside correspond generally with those of the upper surface, and are a smaller rendering of the ♂ pattern; the costa is buff yellow partly from the base, but of a redder tint than in the ♂. The abdomen also is slightly redder buff, but with a similar dorsal dark longitudinal stripe. The colours, number of spots and other details of the thorax and head similar to those of the ♂. For the true structure of the anal segments see Pl. III., and also the diagnosis of the genus.

Length of Costa, 72 mms; of thorax with head, 15 mms.; of abdomen, 26 mms.; of antennæ, 22 mms.; the legs, all but one mesothoracic, are missing, of that the femur is 11, the tibia 21, and the tarsi 8 mms. Number of antennal articulations about 40. Hab. uncertain, as there is no label attached to the specimen. The superficial appearance of this insect on both surfaces is absolutely that of a large *Acræa*.

In the museum of the Hon. Walter Rothschild, whom I heartily thank for the pleasure of figuring this female and the two splendid examples of the ♂.

Of the flight of *Antimachus* Henry Smeathman says "this species flies in the heat of the day with amazing rapidity, seldom descending to within 8 feet of the ground. It glances from the prominent branches of one tree to those of another, as swift as a swallow, and turns its head about instantly to the glade or path, and will not suffer any person to approach within a striking distance of it, but darts away on the least motion of the body. At length, if the Naturalist is patient it becomes more careless." Mr. Rogers and others give a similar testimony: Rogers's first specimen cost him 3 days of patient watching before he effected its capture.

DRURYA ZALMOXIS.

- Papilio Zalmoxis*, Hewitson, "Ill. of New Species of Exotic Butterflies," Vol. III., p. 6, pl. 1, f. 18 (1862).
 " " W. F. Kirby, "Syn. Cat. Diurn. Lepid., p. 564 (1871)."
 " " A. R. Wallace, Address delivered to the Biological Section of the British Association, Glasgow, 1876, page 3.
 " " W. F. Kirby, "Cat. of Coll. of Diurn. Lepid., formed by the late W. C. Hewitson, p. 13 (1879).
 " " Staudinger and Schatz, *Exotische Schmetterlinge*, Vol. II., Pl. 7 (1888).
Ornithoptera Zalmoxis, Fickert, "Ueber die Zeichn. der Gatt. *Ornithoptera*," p. 754 (1889).
 " " ♀, Staudinger, "Iris. Deutsche Ent. Zeitschrift," Band 5, p. 268 (1892).
 " " W. F. Kirby, "Nature," Vol. 51, p. 258, col. 1 (1895).
Papilio Zalmoxis, W. F. Kirby, "Handbook to the Order *Lepidoptera*," V. 2, p. 268 (1896).

The first example of this species was received in 1861 from Old Calabar, by Mr. S. Stevens, as Mr. Hewitson tells us; and the specimen was in such a state of decomposition that the body, except the outer covering of the abdomen, was completely gone. The rich colour natural to the wings had also suffered a great change, so that at the time it could only be surmised from an examination of the unique example, that the true tints had greatly faded into the olive-blue green of Mr. Hewitson's figure. Of course, as usual, this specimen was a ♂. It is always most difficult to obtain the ♀ of any of the *Lepidoptera*: hence, even at the present time there are multitudes of species of butterflies and moths of which we only possess the males. A large number of examples of this fine *Acraeoid*-looking *Papilio* came to hand during subsequent years, but the discovery of the female has been a comparatively recent achievement, and it is still very rarely found in collections.

At a time when so little was known of the *Ornithoptera*, it was a very natural thing to describe *Zalmoxis* as a *Papilio*; although the fact that no true *Papilio* had hitherto been found with a yellow abdomen, might have suggested a closer affinity to the *Ornithoptera* than to the *Papilios*. And we find it in Kirby's catalogue placed away almost at the end of the *Papilios* among some species of African and American things with which it seems to me to have no relationship. But of late years Staudinger and Schatz, and Fickert and others began to suspect its true relationship with the *Ornithoptera*, and Staudinger placed it in the genus *Ornithoptera* as that genus was at the time by him regarded.

But whilst it seems impossible to consider this species as belonging to any other group than that of the *Ornithoptera*, I have felt justified, for reasons given in the diagnosis of the genus *Drurya*, to place it provisionally as a member of that genus, being unwilling to make a new genus for its reception, as may some day be found necessary. Its true position is therefore assigned to the head of the *Ornithoptera* instead of the end of the *Papilios*.

The fig. in Hewitson's work gives but a faint idea of the wonderful beauty of this species, either in colour or details; the thorax, head, and base of the wings, and the outer margin of the hind wings being in themselves a feast of quiet loveliness, while the play of colour on the surface of the wing, as the insect is turned about, is quite as interesting as in any example of the *Ornithoptera*.

Preliminary to a fuller description of this species and its varieties, I will quote in full Mr. Hewitson's diagnosis—made from the unique example then known to him, which as the type form is now in the British Museum,

"Upperside dull green; with the margins, the nervures, and rays between the nervures, black. Anterior wing with the apex broadly black. Posterior wing with the outer margin broadly black, with a sub-marginal band of 12 green spots in pairs; the abdomen orange."

"Underside with the nervures and rays between them, black. Anterior wing, grey-white, with the apex broadly rufous-brown. Posterior wing rufous-brown; the base, orange: with the nervures upon it very black: the cell, which is traversed longitudinally by two black lines, and a portion of the abdominal margin, white; the outer margin with a narrow border of black; the sub-marginal spots as above, but white. Expan., 6 $\frac{2}{10}$ inches. Hab. Calabar."

Mr. Hewitson's figure and description did not so greatly misrepresent the appearance of the species in its pristine perfection as one might at first suppose by viewing a small series of the insect, as may be understood by a reference to plate iii, fig. 3 ♂ of this work, which is an accurate representation of a var. in my own collection. I have seen several other examples which are coloured in a similar manner, and it is difficult to imagine that this is due to damp or any other deteriorating cause. This var. came from the Gaboon, but what part of that district I am unable to say.

The olive-green blue of the primaries is suffused towards the base of the wings with a subdued golden sheen: is very brilliant, and extends also to the sub-marginal band of 12 blue-green spots—when viewed opposite the light is much more brilliant than I have represented it in my figure.

But the general appearance of the colour in the shade or a subdued light, is more that of some of those species of *Romaleosoma* or *Euryphene* which are found at Old Calabar and in West Africa. In this fact there may be a special purpose of utility, even if such example had a tendency to discolour while living, which might possibly be the case. The discoidal cell of the secondaries has no trace of the 2 longitudinal black lines which are a prominent feature of the undersurface mentioned by Hewitson, though in some examples of the normal blue forms these lines are repeated on the upper surface as dotted faintly-black curved longitudinal marks; the base of all the wings, and along (inside) the abdominal fold or gutter (as Westwood called it) is furnished with long light silky hairs, as is also the thorax and base of the abdomen. The amount of black at the apex of the Primaries is greater and broader than we generally find in the bluer examples, and the submarginal black band of the hind wings is also much broader; the white spots

on the head and pronotum are generally from 14 to 16 in number, thereby more fully expressing the acraeoid or danaoid appearance of the species; an elongated triangulate black mark occupies 2 of the abdominal articulations from the base.

The undersurface of the Primaries with nervures and rays dark brown; the pseudoneura of the discoidal cell are fairly prominent—the lower 3 united towards the base as a branch, the upper is independent—a large area of the wing is ochraceous grey-white; the costa is brown; and there is a large rufous or red-brown apical area; the posterior wings with the base brick-red, extending a little way into the cell; the disc is brick-red, shading upwards into rufous brown; the cell is grey-white, subdued by rufous scales, and the contiguous portions of the disc are treated in the same manner; the rufous brown submarginal band has 7 pairs of white spots: the apical pair coalescing; the precostal nervure is broadly black—the upper branchlet being immersed in a black club-shaped mark; in the cell the pseudoneura form 2 longitudinal curved black lines, branching from a basal short black line, by which the cell is completely divided into 4 parts.

The thorax has a considerable number of white spots on each side from the head to the base of the abdomen, arranged between all the legs, which are themselves striped with white on the femora, and spotted on the trochanters: there is also a white spot at the base of the wing, and on the base of the anterior wing costa. The abdomen is orange, with lateral and subdorsal black spots and quadrate marks, generally with a white spot in the centre of them; the anal segment is the same colour as the rest of the abdomen. Expanse of the costa, 73 mms. Hab. Gaboon.

♂. In the Horniman Museum. Wings steely blue; very silky, greenish or purplish in some lights; the Secondary submarginal band of twin spots are 12 in number, with 2 minute spots at the anal angle: all steely blue, but growing silvery white at the apex of the wing. The Primaries with the veins all deep black: the black rays irrorated on each side with black scales—the lower rays very short, and merging into a black irregular mark. The subcostal band is black, with a delicate ray of greenish-gray scales; the apical black area less than in the preceding example, which appears to be the normal characteristic. The secondaries with the submarginal black band narrower than in the last example, and blended into the blue by blue atoms between the veins and rays.

Under surface. Primaries grey bluish-white, showing in a strong light a warm blush towards the outer margin; a short dark line obliquely from the distal end of the cell; base of the wings clouded with black atoms; the submedian fold is black at the base, and along its whole length is placed a little below the black submedian ray: the costa is black, and apical area fuscous brown. The posterior wings differ very little from the preceding example, except that the brick-red area from the base is rather more extensive.

Length of costa, 79 mms.; greatest width of Primary wing, 46 mms.; length of secondary wing, 50 mms.; width, 36 mms. [The third subcostal nervure begins at the apex of the 1st discocellular nervule.] Length of antennæ or abdomen, 25 mms.; of thorax with the head, 11 mms.; eyes and villose tuft prominent. [The antennæ

are shorter in proportion to the wing, than in most of the Ornithoptera.]

Length	{ 1st pair: femur, 10; tibia, 8; tarsi, 11 mms.
of legs:	{ 2nd " : " 12; " 12; " 12 "
	{ 3rd " : " 10; " 11; " 12 "

Hab. Isubu.

[I am indebted to Mr. F. Horniman for the loan of this example.] See Pl. IIIA, figs. 1, 2, and 2A.

♂. In the author's museum. Wings a slightly greener blue, but very blue towards the apex: apical area of black, less extensive than in the preceding; the secondary wings with the black submarginal band interrupted by green-blue atoms, which make the blue of the wing nearly continuous with the blue submarginal twin spots, and give nearly all the black rays the aspect of an oval black mark on the lower part of the ray. On the underside the cell of the posterior wing is whiter than usual, but otherwise there is no important difference. Length of costa, 80 mms. Hab. Congo.

♂. In the author's museum. The submarginal row of twin spots on the posterior wing much smaller and orbicular. Underside, with the base, and the whole of the cell clouded with dark atoms; the cell of the posterior wing is unclouded grey, but the fuscous brown of both wings is darker. Length of costa, 80 mms. Hab. Calabar.

There are 6 ♂♂ at present in the British Museum, excluding the Hewitsonian type. ♂. The browns of the under surface chestnut brown; the posterior wing submarginal band is reddish black, the light twin spots well expressed. Hab. Cabinda, N. of the Congo.

♂. British Museum, upper side of wing very greenish blue. Hab. Old Calabar.

♂. Ibid. Upper side of wings lighter green-blue; under surface of the hind wings nearly entirely suffused brownish-red. Hab. Cabinda.

♂. Ibid. Very violet-blue on upper wings; the inter-nervular rays not so stout as on the lower wings. Hab. Calabar.

Examples from the Cameroons do not differ materially.

The British Museum does not possess a ♀ of this species, although the Godman and Salvin series is now amalgamated with the national collection. Prior to the late Mr. Hewitson's death, he became possessed of other examples of this species, and consequently the Hewitsonian collection in the British Museum contains 5 specimens, including the type, which are all males.

Apropos of the colour resemblance of this species to some of those of the genera *Romaleosoma* and *Euryphene* (notably *R. ravola*, Hew., *R. cutteri*, Hew., *R. ruspina*, Hewit., and *R. luperca*, Hew., all from Old Calabar; *R. Zampa*, Westw., from Sierra Leone; *R. rezia*, Hew., from the Gaboon; *E. carshena*, Hew., and *E. phranza*, Hew., from Old Calabar; *E. lesbonax*, Hew., from the Niger; *E. eliensis*, Hew., from the Gaboon, with several others) we find several species of the *Nereus* group of *Papilio*s assuming

more or less, the blue-green key of colour so peculiar to many of the species of the above-named genera. This peculiar colour-plan seems to be confined to the African continent, and chiefly to the western parts of it.

Since writing the foregoing, and by the kindness of the Hon. Walter Rothschild, I have been able to present, on Plate IIb, figures of the ♀ of *Zalmoxis*, by which it will be seen that the insect so closely resembles the examples of the ♂, that if a number of specimens of the two sexes were mixed together in a box, it would be very difficult, if not impossible, to separate them except by an examination of each anal segment. The peculiar colour of the wings on the upper surface, the width of the black border of the posterior wings, the light hairy gradation from white to blue-green of the inner margin and base of the same wings, the depth and prominence of the black veins, the shape and arrangement of the black internervular rays, and the black of the anterior wing costa, are absolutely identical with those of the average male; the same may be said of the marginal blue-green spots of the hind wings. Of the undersides of the wings the same may be observed. The lilacine white of the anterior wings may be a little deeper than in the ♂ ♂ figured on Pl. IIIA., but then no two of the ♂ ♂ present the same depth of tint. The brownish-red of the hind legs is perhaps more graduated from the ochraceous brown to the brick-red than in most males, and these may be slightly less white, and that confined to the discoidal cell; the abdominal margin may also be more ochraceous white than usual; but I have no doubt that if we were to examine a large number of examples of the two sexes we should find that there would be no appreciable difference between a series of each sex. The head, thorax, and abdomen do not differ in any respect from the ♂ form except, of course, in the sexual character of the anal segment. It should be remarked here that by holding the insect opposite the light in such a position that the eye can view it on a level with the edge of the wings, the wing nearest to the eye is seen to assume a delicate light golden-pearly tone—the blue-green, or green-blue, having entirely disappeared—though it may be seen on the other wing.

The example from which the figure is drawn is rather larger than that of the ♂ of fig. 1 in Pl. IIIA., as the following measurement will show:—

Length of costa, 81 mms.; greatest width of primary wing, 54 mms.; length of secondary wing, 53 mms.; width, 40 mms.; [the 3rd subcostal nervure begins just below the apex of the 1st discocellular nervule.] Length of the antennæ or abdomen, 25 mms.; of thorax with head, 21 mms. [By an error on the previous page, (column 1, the last line), the length of the thorax and head of the ♂ is given as 11 mms.; it should however be 21 mms.]

The trochanters and femora of the legs in this sex are well defined with white; the whole of the thorax on the undersides is also jewelled with white spots as in the ♂; the upper portion of the thorax and head also closely resemble the ♂;—or with the same plan of markings so characteristic of the *DANAINÆ* and *ACRÆINÆ*, and of the *Papilionines*, *Eresias*, *Lycænidæ* and *Erycinidæ* which in any degree mimic those protected families.

Length of legs. { 1st pair: femur, 11; tibia, 9; tarsi, 11 mms.
2nd " : " 12; " 12; " 12 "
3rd " : " 11; " 11; " 12 "

Hab. The label of this example has *Bopoto* printed on it. The correct name must be *Upoto*, on the Great Congo, in 21° 55' E. long., and 2° 15' N. lat.

In the museum of Hon. W. Rothschild, and of Dr. Stäudinger. The colours of the different examples of this species vary sufficiently to enable the Belgian Entomologists to divide the species into 3 varieties, viz., the normal, the green, and the grey varieties. [See page 73 of this vol. A list of localities where the species has been taken (as sent to me by Herr Wenig, director of the Musée Royal d'Histoire de Belgique, Brussels) is also given on page 73 of this vol. As so much of the Congo district is within the Belgian jurisdiction, our Belgian Entomological brethren have had exceptionally good opportunities of collecting large series of this species, and also of *D. Antimachus*.

Genus SCHOENBERGIA.

Ornithoptera, Pagenstecher, Beiträge zur Lepidopteren : Fauna des Malayischen Archipels. Jahr-büchen der Nassauischen Vereins für Naturkunde, 1893, p. 83.
Schoenbergia (Sub-genus), Pagenstecher, in the same paper.

♂. Primaries subtriangular, or perhaps almost quadrilateral,—the base being the shortest side, though much larger than in Ornithoptera or the other genera: a fairly close definition of its form would be sub-scalene-triangular. Costa only moderately arcuate; hind posterior margin somewhat irregularly curved, with a small convexity at the middle where the 1st and 2nd median nervules terminate, then curving slightly inwards between the terminals of the 3rd median and submedian nervules; the anterior margin nearly straight; with no stigmatic band, as in ORNITHOPTERA and ÆTHEOPTERA. Secondaries smaller in proportion than the primaries; costa sufficiently arcuate, and only a little more than half the length of the interior margin of the primaries; the posterior margin extends nearly in a straight line till it reaches the caudal prolongation or tail of the wing, which curves outwardly, and is very narrow, finally terminating with a fine point; the tail is nearly as long as the rest of the posterior margin.

The neururation of the posterior wings differs in important respects from that of other genera; the costal nervure is normal; the discoidal cell, which is enclosed by the subcostal nervure, disco-cellular nervules, and median nervure (which generally may be said to have 7 divisions, not including the basal portion from which the costal and subcostal branch off) has in this species only 6; the 1st median nervule, about 2 mms. from its starting point, separates into two branches, thereby uniting as its branch the 2nd median nervule; the 3rd median nervule runs down to the end of the caudal prolongation or tail; the submedian vein is fairly normal; the branches of the costal and median veins are very short by comparison, all these arrangements being obviously for the purpose of strengthening the wing; the discoidal cell of each wing is broad, that of the anterior wing being slightly the widest; the posterior wing cell is not much less than 5-7ths of the whole length from the base to the posterior margin; to a median line, which nearly equally divides the abdominal margin, is attached a dense row of creamy white long hairs, which in a state of rest would almost entirely envelop the lateral and subdorsal parts of the abdomen. The *pseudoneura* of the anterior wings are sufficiently distinct, especially the 2nd, 3rd, and 4th, all of which run fairly parallel, and branch off all of them from the basal stem at short distances, one above another, the 1st terminating where the 2nd subcostal branch begins, the 2nd at the base of the 1st discoidal, the 3rd midway of the 2nd discoidal and the 1st median branches, and the 4th nearly midway of the 1st and 2nd median branches; a dark *pseudoneurus* or fold runs about midway of the 3rd median branch and the submedian nervure; only very faint traces can be seen of the *pseudoneura* in the cell of the secondary wings: they are 2 in number apparently, the 1st united with the 2nd at the base curves outward along the middle of the cell, the 1st and shortest curves inwardly.

Head: eyes prominent, very uniform, with very white lunules; palpi very short, hidden by a very

short villose tuft; haustellum only moderately long; antennæ long and not very robust, about half the length of the costa of the upper wing; thorax with no red collar; the usual longitudinal green median striga of Ornithoptera in this genus replaced by a mark that is very broad at its base, and narrow at its apex, hastate in form, with a black excised basal posterior, giving it the character of a golden green corset; the sternum with a small red patch between the 3rd and 2nd pairs of legs near the base of wing; abdomen beautifully curved on each side, and becoming broader till it reaches the penultimate segment which is broadest, from which the anal valvular segment curves again to a nearly obtuse point; a pale grey divided dorsal stripe extend from the 2nd to the 6th segments, broad at the top, narrow at the bottom, with 5 lateral black dots.

Legs only moderately robust, the femora pale golden yellow, with dark front margins. Some of the nervules of the lower wings have a tendency to wrinkle, and throw off fold branchlets as if passing through a disturbing area: this may or may not be accidental.

♀. Anterior wings rather larger and longer in proportion than the posterior; costa of anterior wing more arcuate than in the ♂; posterior margin curved outwardly from the anterior angles, then distinctly concave from the terminals of the 1st discoidal to the 2nd median nervules; the interior margin more strongly curved; the veins all fairly prominent above and below the wings. Posterior wings nearly straight along the costa, and curved at the anterior angle; posterior margin only slightly lunate between the veinlets, with white marginal fringe lunules; interior margin with a fairly normal curvature. The *pseudoneura* in the cell of the anterior wings arranged in the same way as in the true Ornithoptera—the 2nd disco-cellular nervules being more than usually distorted by the fold which runs to the hind margin and particularly within the cell. The whole appearance of the wings differs undefinably from those of the genus ORNITHOPTERA, though suggesting that genus strongly.

Head: eyes prominent, labial palpi very short, and hidden by a very short villose tuft; antennæ nearly 2-3ds shorter than the costal length, and only moderately robust.

Thorax robust with a large portion of the sternum clothed with crimson scarlet, the legs having their femora pale yellow, edged outwardly with black. Abdomen broad, and broadest at the penultimate segment.

♂. The characteristic exceptions in *S. tithonus*, of de Haan, on the upper wings are that they are not so large proportionately with the lower wings, that the interior margin is not quite so straight a line, or so short relatively to the costa of the lower wing, that the outline of the exterior margin is somewhat concave instead of convex in the middle, that the median vein branches of the lower wings are not so short, and are normal in arrangement, and that there is no caudal prolongation to the

wing. Otherwise, on the upper wings at least, the pattern is arranged pretty much after the same plan. There are some important differences in the thorax and dorsal portion of the abdomen, though the latter is probably only a specific difference. Antennæ not so stout as in ORNITHOPTERA; an inner curvature is found near their

apex, somewhat different from what is seen in other ORNITHOPTERA, especially in the ♀.

The femora of the legs in both sexes are broader and flatter than in the other genera; and the length of tarsal joints longer in proportion than in ÆTHEOPTERA.

SCHOENBERGIA PARADISEA.

Ornithoptera Paradisea, *Slaudinger*, Entomologische Nachrichten 1893, s. 177.

" " " Iris, Jan. 1894, p. 350, Band 6, Pl. 6, f. 1.

Ornithoptera Schoenbergi, *Pagenstecher*, Jahrbüchen der Nassauischen Vereins für Naturkunde, 1893, s. 29 pp., Taf. II., n. III. (♂), s. 83 pp., Taf. IV. ♀ Anfang, October 7 1893. " Beiträge Zur Lepidopteren—Fauna der Malayischer Archipels."

" " " Pages. Description, p. 30, Pl. 2, 3, ♂; 4, ♀.

O. (Schoenbergia) Paradisea, *Pagenstecher*. (Treated as a subgenus.)

Since the discovery of the ♂ of *Æ. Victoria* by Mr. Woodford a few years ago, no ORNITHOPTERA, and perhaps no butterfly known to science is at once so beautiful and so interesting as the ♂ of this extraordinary and glorious species. Hitherto no ORNITHOPTERA had been found with a caudal prolongation of the hind wings—although there was no reason why such a form might not exist, and it was what an observing and reflecting Entomologist might have expected, for seeing that so large a number of the *Papilionina* are tailed, and that the same, or at least very closely allied, species in many cases are tailed or without tails according as they are found on the continent or a small island, or according as they are more east or west of each other, (and that we have dimorphic and polymorphic forms belonging to the same species and in the same locality exhibiting these differences): we say then that it is not so remarkable that the ORNITHOPTERA should furnish us with an example of this phenomenon. Probably other tailed forms will yet come from the interior of New Guinea, or from some of the Solomon, New Hebridean, or Malayan islets. As we shall yet have to regard the *Papilionina* belonging to the red and black, and green and black, groups of South and Central America, as a second division of the ORNITHOPTERA, which I propose to call *Ornithopterina* or *Ornithopterina* and as these are generally understood to come in our classification immediately after the ORNITHOPTERA—we at once see that tailed forms are not such rare phenomena as at first might be supposed, for the ♀♀ of some of the ORNITHOPTERINA are tailed.

In the present case it is the ♂ that possesses the caudal prolongation of wing; but I am inclined to think that the ♀♀ of this, and of the genera ORNITHOPTERA and ÆTHEOPTERA are intended to resemble in some degree some other species of butterflies, or of moths, or possibly even of Birds, for the purpose of protection. In my diagnosis of the Genus *Schoenbergia* (for I have felt justified in raising *Pagenstecher*'s subgenus to full generic rank) the more important structural characters are given. The following are therefore the decorative and other characters of this species:—

♂. Anterior wings deep velvety black, in which the veins, except the median, are not so conspicuous. A

subcostal green stripe extends from the base to a little over half way of the costa, separated, but narrowly, from a very broad golden green subcostal patch or band which extends from near the base within the discoidal cell, gradually broadening till it reaches to within 16 mms. of the apical angle, where it curves above and below gradually to 2 mms. of the apex; the whole patch or band is graduated off, more especially within the cell, by golden yellow atoms; portions of the subcostal nervure, the 3rd, 4th, and 5th subcostal nervules, with the first discocellular nervule, visible in the green—the subcostal vein and its 4th branch being especially defined in black; a large discal patch of golden-yellowish-green begins narrowly at the base, filling all the space between the 3rd median branch and the submedian nervure to within 6 mms. of the outer margin,—also less and less of the spaces bounded by the 3rd median and the 2nd discoidal branches—receding from the median and outer margin more and more till it almost becomes a point—each division being curved inwardly from the outer margin and irregularly from the side of the median nervure, with much beautiful gradation by green atoms on the black, and black atoms scattered on the green; a golden yellow band beginning at the base in union with the above patch includes the precostal nervure and extends nearly 2-3rds of that part of the wing till it becomes a mere point, ending with a few green atoms—its broadest about 2.5 mms.; on the black which divides it from the discal green patch are scattered a few golden green atoms. The anterior wing is nearly subtriangular, or more correctly, subscalene-triangular, the outline of the wing being a close suggestion of the outline of the shell of the molluscos genus *Pinna*, especially one of the Japanese species—being very narrow at the base and broad at the outer margin; the outer margin curves somewhat irregularly, being a little convex in the middle where the 1st and 2nd median branches terminate, curving inwardly and prominently between the terminals of the 3rd and 4th median branches, and the submedian vein; the outer margin without white lunules; the anterior margin nearly straight.

Posterior wings smaller in proportion than the anterior, the costa sufficiently arched, and only a little more than half the length of the interior margin of the upper wing,

giving it a very unusual appearance. The hind margin extends down nearly in a straight line till it reaches the tails which curve outwardly, are very narrow till they reach a fine point, and nearly as long as the rest of the outer margin; the abdominal margin is very beautifully formed, sharply divided by a median fold and at its junction with the tail by a sharp dentation, as if a small triangular piece had been excised to more conveniently allow the marginal section to lie over on to the rest of the wing if needful, as it probably does sometimes; the abdominal margin is not furnished with a pouch or receptacle for *androconia* like the ♂ members of the POMPEOPTERA as might have been anticipated, but it possesses a most remarkably broad and elegant creamy-white fringe attached to the median fold on the under surface; the whole of the wing, which includes the greater part of the discoidal cell is a rich silky golden, semi-diaphanous, texture divided by the subcostal nervure and its 1st branch and the 2nd discocellular nervule—the gold extending longitudinally towards the base of the caudal prolongations or tails where it tapers off to a point; a submarginal band of golden green extends down the entire wing, and 1-3rd within the narrow tail, where it unites with a second narrow green band which extends to the base, occupying that part of the cell not filled by the silky gold, and also a small scalene-triangular discal spot on the black outside the 2nd discocellular nervule; a small golden spot in the green outside the 2nd subcostal branch; the inner marginal portion of the wing and abdominal fold are a deep velvety-black. The posterior margin is narrowly black from the costa and both sides of the tail; at the inner margin of the tail are a few golden green atoms; a faint line of grey atoms between the 2nd and 3rd subcostal nervules.

Undersides of anterior wings with the discoidal cell and nearly all the discal area golden green or golden yellow, a lighter green at the base of the cell, darker at the farthest from the base, extending more or less outside the cell till it becomes entirely golden yellow; costa brownish black; outer margin brown black—narrowly to the 3rd discoidal nervule, when it broadens irregularly till the black extends, and indents into the spaces bounded by the 1st discoidal and 4th and 5th subcostal nervules encroaching in two places considerably into the disc; the veins are all strongly black, delicate in structure, and broadly margined with velvety black; the golden green nearest the apex is dusted with black atoms, and the black next below by golden green atoms; the inner margin is narrowly black half-way, then broadly black on the area containing the internommedian vein to the base.

Underside of the secondary wings with a similar portion corresponding to that on the upperside golden silky, with also a small spot of the same colour corresponding to that above—the veins being a darker yellow and well expressed. The remainder of the wing is golden green down to 2-3rds of the tail, with veins of the same colour; no black in the costa, and only a narrow black outer and inner marginal line, broadest at the inner side of the tail with 1-3rd of the tail entirely black; abdominal margin or fold, through which the submedian veins runs, and to the median line of which the fringe is attached, a delicate pearly silver grey; the bifid precostal nervure is black with a faint outward curved line of dark atoms above it.

♀. Anterior wings, upper surface, smoky brownish black, with a slightly opalescent greyish sheen; very

opalescent along the inner margin and towards the hind margin when viewed obliquely opposite the light; an irregular large bidentate tetrahedral patch of white within the discoidal cell, occupying a position not quite midway of the entire wing length, being situated nearer to the base than to the apex; there are 8 submarginal white spots, and 2 discal; the 1st (within the 3rd and 4th subcostal branches) oblong: the 2nd (within the 4th and 5th subcostal branches) acuminate; the 3rd (within the 5th subcostal and 1st discocellular) oblong, sinuate within and dentate without: the 4th (within the 1st and 2nd discocellular branches) acuminate and shorter: the 5th (within the 2nd discoidal and 1st median branches) obtuse cuneiform: the 6th (between the 1st and 2nd median) small, suborbicular: the 7th (between the 2nd and 3rd median) rather larger, pointed towards the hind margin: the 8th (below the 3rd median) is suboval and small; a short discal oblong grey white mark within the 7th submarginal spot, and a spot of grey-white atoms nearly close to the median vein, between the 1st and 2nd branches; all the white marks are modified into grey white more or less by grey atoms or scales.

Posterior wings above, smoky brownish-black, with a slightly greyish sheen; a discal band of ochreous greyish white, very narrow at the costa—and so broad towards the inner margin as almost to fill up the entire space between four of the nervules—extends from the anterior to the anal angle, and contains suborbicular black spots, the 1st and 4th being the largest, and the 2nd, 3rd, and 5th the smallest; below, these, as well as in the two divisions of the white band above the spaces, are olive yellow-brown—the greyish part of the white, and the olive tone of the yellow brown being caused by the beautiful gradation of the grey and darker scales with which the band is more or less dusted; this band is strongly lunulate without, and irregularly sinuate nearest the cell; the submarginal portion of the wing broadly brown black, with white fringe lunules; the precostal nervure prominent on a slightly shining surface.

Posterior wings, under surface, a rich warm dark brown or black, the veins all standing well in relief; the white markings similar in number, position, and shape as above, except that the two discal nearest the cell are larger, and the 8th is longer and less ovoid, and a small or 9th white submarginal spot is found below the submedian pseudoneurus or fold; none of the light markings are modified by dark atoms; the outer margin with white fringe lunules.

Posterior wings, under surface, more intensely dark-brownish black; all the veins (which are not robust) standing in prominent relief; the discal band occupies exactly the same area as above, the 5 black spots being also of the same size; the space above the latter a delicate creamy-white, below a pure pale lemon yellow—the two divisions above the spots of the same yellow; the lunulations towards the posterior margin rather more sinuate than above, and softened into the black by black atoms; the outer margin broad black as above, with creamy white fringe lunules; the space within the precostal cell is white.

Head: Eyes very dark brown and prominent, with light red margin. Thorax velvety black, without a green longitudinal striga; sternum: prothorax black, meso- and metathorax crimson; legs black, except the femora, which are pale yellow and black. Abdomen, 1st segment dark brown, with crimson scarlet hairs on either side; 2nd segment greenish grey with black scales and a central

dark mark; the rest of the abdomen ochraceous yellow-white, shading off into lemon yellow, more ochreous towards the anal segment; subdorsal a rich orange yellow, with the articulations strongly defined by black and almost obsolete lateral black dots. The fringe of the anal valves and last subdorsal articulation fairly long and thick, and golden orange.

When viewed very obliquely against the light the whole of the green and golden-green of the ♂ anterior wings and the green of the posterior is seen as a rich fiery red orange, as intense as in *O. Lydius* of Felder.

♂. Length of costa of primaries 74 mms.; of outer margin 55 and of interior margin 35 mms.; of secondaries, costa 22 mms.; of outer margin to extreme end of tail 47 mms.; greatest width of wing 23 mms.; greatest width of fringe 7 mms.; length of abdomen 38 mms.; of antennæ 37 mms.; of thorax with the head 22 mms.; articulations of antennæ about 50.

Length of legs. { 1st pair—femur, 12; tibia, 10; tarsi, 14 mms.
2nd " " 14; " 14; " 17 "
3rd " " 12; " 15; " 20 "

♀. Length of costa of primaries 92 mms.; of hind margin 64 mms.; of inner margin 47 mms.; costa of secondaries 35 mms.; abdominal margin 55 mms.; length of wing 61 and width 37 mms.; of abdomen or antennæ 33 mms.; thorax with head 20 mms.; antennæ with 58 articulations.

Length of legs. { 1st pair—femur, 12; tibia, 9; tarsi, 12 mms.
2nd " " 13; " 14; " 15 "
3rd " " 12; " 14; " 20 "

For a sketch of the anterior leg see the figure in the plate illustrating this article. [Pl. IV., fig. 5.]

In Staudinger's figures of *S. Paradisea*, ♂, the 4th discocellular nervule is a broader black than in my types; the black abdominal margin is also a little broader. On the under surface of the 2nd discoidal nervule is a black mark across the veins which passes a little into the cell; also a little more black in the divisions in the upper part of the cell.

Habitat: Sattleberg or Saddleberg,* Finistere Mountains, German New Guinea. "Finisterre-Gebirge nach Konstantinhafen brachte—S. German New Guinea."—Discovered by Herr Kubary.

An example of the ♂, rather smaller than the one figured in this work, is in the possession of the Hon. Walter Rothschild, to whom I am indebted for the pleasure of describing and figuring this most wonderful species. As will be seen by the bibliography at the head of this article the species was previously described and figured by Staudinger and Pachenstecher in their respective journals.

* Saddle-shaped Mountain.

SCHOENBERGIA TITHONUS.

Ornithoptera Tithonus, ♂ De Haan, Verhandeligen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen.—p. 18, t. 1, f. 1, (1841).

O. *Tithonus*, ♂ E. Doubleday, Genera of Diurn. Lepid. p. 4, n. 4 (1846).

Papilio Tithonus, ♂ Gray, Cat. Lep. Ins., Brit. Mus., I. p. 5, n. 8 (1852); Gray, List. Lep. Ins. B. M. I. p. 3, n. 8 (1856).

Ornithoptera Tithonus, ♂. Vollenhoven, Tijdsch. v. Ent. III., p. 71, n. 3 (1860).

Papilio Tithonus, ♂ Felder, Verh. z. b. Ges. Wien., p. 290, n. 6, and p. 331, n. 4 (1864).

„ „ ♂ W. F. Kirby, Syn. Cat. Diurn. Lepid. p. 518 (1871).

Ornithoptera Tithonus, Butler, Lepidoptera of the South Sea Islands; Proc. Zool. Soc., 1874, p. 289.

„ „ ♀, Oberthür, Annales de la Société Entomologique de France, Bulletin, p. cxxii. (1885).

„ „ ♀, Oberthür, Etudes d'Entomologie, 12th livr., p. 1, n. 1, t. 3, f. 10 (1889).

„ „ ♂ and ♀ Dr. C. Fickert, Ueber die Zeich. der Gatt. Orn. p. 720; ♂ t. xx, f. 6; ♀ t. xxi, f. 1 (1889).

Troides Tithonus, Walter Rothschild, Novitates Zoologicae (Rev. of Pap. of E. Hemisph., exclusive of Africa), Vol. III., p. 195, n. 4 (1895).

Ætheoptera ? Tithonus, W. F. Kirby, Nature, Vol. 51, p. 256 (1895).

Schoenbergia „ Rippon, Nature, Vol. 51, p. 343 (1895).

For a period of 44 years the only representative of this species known in Europe was the type specimen of the ♂ in the museum at Leyden. What the ♀ could be like was a question, the answer to which was a long time delayed. Accomplished Entomological specialists, like the late Prof. J. O. Westwood of Oxford, and others, were for a long time inclined to regard the type ♀ of *Victoria* in the British Museum as the missing sex of *Tithonus*, but there were difficulties in the structure of the two insects which rendered that idea somewhat untenable; and so for several years our desiderata were the ♀ of *Tithonus*, and the ♂ of *Victoria*. Until the ♂ of these species could be carefully compared with each other, it was impossible to suppose that they belonged to two distinct genera, possibly only distantly related to each other, a conclusion from which we cannot escape, now that the two sexes of each species are known. The ♂ of *Victoria* was discovered by Mr. Woodford in 1886, the ♀ in 1855 or 1856; the ♂ of *Tithonus* in 1840, and the ♀ in 1885. When the ♂ of *Victoria* was discovered a considerable number of ♀ ♀, differing very little from the type, were also obtained, and it became certain that if Oberthür's ♀ *Tithonus*, described by him in the "Annales de la Société Entomologique de France," were not the ♀ of that sex, it had yet to be sought for. I am by no means quite sure that the few examples now known may not be vars. of the ♀ *Paradisaea* or of some other tailed species of the genus *SCHOENBERGIA* yet to be discovered—though there are certainly some conspicuous differences between the ♀ ♀ of the two species. What these differences are will be seen later on. Meanwhile I give below De Haan's original description of the ♂, with, I trust, a fairly literal translation of it for the benefit of English students; to be followed with some notes on some of the examples which have since reached Europe.

♂. "De bovenvleugels zijn swart, met drie groen-gele banden; de ondervleugels ovaal, groen, met een goudgeel middelvlek en eenen zwarten buitenrand.

"Deze prachtige vlinder heeft $7\frac{1}{2}$ vlg. de bovenvleugels hebben op eenen donker zwarten grond drie banden, welke zich van de basis tot bij den buitenrand uitstrekken; de bovenste band loopt langs de binnenrandader, is boogvormig, zeer smal tot op het midden en loopt verder boven gemelde ader breeder uit; de middelste heeft den vorm eener S, strekt zich over de middelcel en over de ruimt tusschen de Vierde en zesde ader uit en eindigt

nabij den buitenrand in eene omgebogene punt. De derde band loopt langs den onderrand langzamerhand smaller toe en is korter dan de twee vorige. De ondervleugels zijn ovaal smaller dan van *Priamus*. Een goudgele band strekt zich over de geheele lengte uit, maar is tusschen het einde van de middelcel en den buitenrand afgebroken; dezelve neemt een groot gedeelte van de middelcel, langs de onderrandader en twee derde gedeelten der vakken tusschen de eerste en vierde ader in, alwaar hij drie bogten vormt, in welke even zoo vele zwarte vlekken liggen. Het afgezonderde gedeelte bestaat uit twee vlekken tusschen de vijfde en zevende ader, van welke de binnenste eens zoo lang is als de vorige. Een grasgroen veld sluit zich tegen den goudgelen band aan, bevat het onderste gedeelte der, middelcel, de binnenste heeft tusschen de 4de, 5de, en 6de aders en vormt den geheelen buitenrand van het middelvlek. De binnenrand is breed omgeslagen, breed zwart gezoomd, van buiten grijs en gedeeltelijk met digte, lange, vleeschkleurige haren bedekt die zich over het achterlijf uitstrekken. De buitenrand heeft eenen smallen zwarten zoom en is golvend uitgesneden. De vleugeltop is stomp; de anaalhoek uitgesneden, de onderzijde der bovenvleugels is voor het grootste gedeelte groenachtig geel, met uitzondering van den geheelen rand, van eenen breeden, schuinen dwarsband over het midden en van drie zwarte vlekken langs den buitenrand tusschen de vierde en zesde ader, die gezamentlijk zwart zijn. Op de ondervleugels ziet men hetzelfde goudgels veld als op de bovenzijde; overigens zijn dezelve geheel grasgroen, met eenen zwarten band onder de middelader, welke zich tot de helft der vleugels uitstrekt, met eenen licht gelen anaalhoek, eene zwarte vlek aan den top der middelcel en vier vlekken van dezelfde kleur tusschen de eerste en de zesde ader; de buitenrand heeft eenen smallen zwarten zoom. De borst is geheel zwart. Het achterlijf geel met twee zwart vlekken op de boven zijde van iedere geleiding."

The upper wing is black, with 3 greenish-yellow bands; the under wing is ovoid and green, with a gold-coloured central space, and a black outer margin. This splendid butterfly has an expanse of $7\frac{1}{2}$ inches. The primaries have, on the upper side, a deep black ground, upon which are the 3 yellow bands (or marks) each of which extends from the base almost to the margin of the wings; the uppermost band runs its course within the inner edge of the vein, and is narrow and curved; the centre band runs its course from the above-mentioned vein, and

becomes more ample after leaving the discoidal cell—extending over the 4th and 5th veins, almost describing the figure of an S, finally turning up to a point near to the outer margin, the 3rd band runs along by the under (inner) margin, gradually diminishing in breadth to its termination, and is shorter than the two former. The under wing is oval, smaller than that of *O. Priamus*; a golden-yellow band extends over the entire length from the base, but between the extremity of the discoidal cell and the outer margin is abruptly broken off; as is a by no means large part of the cell along its lower portion; about 2-3rds of the space between the first and fourth veins are occupied by 3 sinuate figures, containing also 3 equal sized black spots; the separated portions consist of 2 sordid spots between the 5th and 7th veins, of which the uppermost is not so large as the lower; a green ground is close to the golden-yellow band, comprising the lower portion of the cell, the lower half between the 4th, 5th, and 6th veins, and from thence entirely to the outer margin from the middle patch; the inner (interior) margin is broad, and (strongly curved) with a wide dark edge, outwardly grayish, and partly turned around (omgeslagen) clothed with dense flesh-coloured hairs that reach over the abdomen. The outer margin with a small curved portion of the edge, black. The apical angle of the wing is obtuse, and the anal angle curved outwardly.

The under surface of the wing, with the exception of the large black portion is greenish yellow; the whole black mark from the base becomes suddenly a large sloping oblique (or transverse) band over the centre of the wing, followed by 3 black spots, between the 4th, 5th, and 6th veins, parallel to the outer margin, which itself is altogether black. The under side of the hinder wing is almost entirely of the same golden yellow as upon the upper surface—the rest of the wing space being quite green, with a black band under the median vein, which extends itself along half the wing (from the base) followed by a light yellow mark to the anal angle; a single black spot occurs on the end of the cell, and 4 sordid spots of the same colour between the 1st and 6th *veins; the outer margin with a narrowing black edge.

The thorax is entirely black; the abdomen rich yellow, with two black dots on the upper side of each articulation.

It may be observed, in comparing de Haan's fig. of the type ♂ of this species with the ♂ of *S. Paradisea* that, as I have pointed out in the diagnosis of the genus (page ix.) though there are important differences between the two species, one feels fully justified in including them both in the same genus; but while this is the case the divergences are much greater between their males and the ♂ of *Æ. Victoria*, and such as to sufficiently prove that they are not congeneric with *Victoria*.

(a.) The costa of the anterior wing of *Paradisea* is almost a straight line, only curving very sensibly towards the apex; in *Tithonus* the costal arch is very strongly pronounced; the apex in *Paradisea* is rather sharply pointed, in *Tithonus* the respective curves of the costa, apex and posterior margin graduate almost insensibly into each other, giving the wing almost a subcostal outline instead of

the singularly obvious triangulate outline of *Paradisea*; the posterior margin of *Paradisea* is conspicuously convex, of *Tithonus* concave.*

(b.) The neurulation of the *Tithonus* anterior wings bears a closer superficial resemblance to that of the ♀ of *Paradisea* than to its ♂; and a yet closer resemblance to the corresponding wing of *Æ. Victoria*; but the arrangement of the median nervules in *Victoria*, the singularly curved discoidal nervules, the direction of the 1st and 2nd discocellular nervules, and the ample cell are not repeated in *Paradisea*, and as far as the cell is concerned only slightly in *Tithonus*. As a set-off to these facts we find the 4th and 5th subcostal veins branching off at a great distance from the end of the cell in *Paradisea* ♂ and ♀, and *Victoria* ♂ and ♀, but at a very short distance from the same point in the ♂ of *Tithonus*. The 3rd subcostal vein commences at the apex of the cell, as in *Paradisea*: in *Priamus* a little beyond (but this distance varies a little in the genus *Ornithoptera*), in *Victoria* and its allies also a little beyond, and sometimes exactly at the apex of the cell. On the posterior wing of the latter the neurulation resembles that of *Victoria* more closely than of *Paradisea*, the outline of the wing is more like that of *Victoria*; but the anal angle and abdominal fold are obviously related to those of *Paradisea*.

(c.) The anterior wings of *Victoria* and *Paradisea* are formatively more alike than are either to *Tithonus*.

(d.) But it is when we observe that neither *Paradisea* nor *Tithonus* possesses a stigmatic brand, or even an abdominal fold, as do the males of the other genera of the *Ornithoptera* (*Drurya* excepted)—that the colours of the two species are most like each other, and least like those of *ÆTHEOPTERA*,—that the ♂ of *Paradisea* is tailed,—that the abdominal fringe is white and long in *Paradisea*, and long and light sienna-brown in *Tithonus*; and very unlike that of any other genus,—that the abdomen is different in shape and arrangement of markings, though in the former case most like that of *Victoria*,—that the shape of the head and eyes of *Paradisea* differs from that of any other *Ornithoptera*, being much like the head and eyes of a dipterous insect,—and that the form of the legs, and colour of the femora differ also, we at once find the amplest justification in placing *Tithonus* and *Paradisea* provisionally in the same genus, and regarding them as only distinctly related to the genus *ÆTHEOPTERA*. Then as regards the females, though they are unlike those of *Victoria*, there is a strong resemblance to those of the genus *ORNITHOPTERA*, but a still closer resemblance to those of the different members of their own genus. We should not feel justified in placing the females of *Paradisea*, *Tithonus*, or of Oberthür's *Goliath* in the genus *Ornithoptera*, though they appear to be closely related. It is difficult to fully define the differences which distinguish the two sets of species, but we may call attention to the light-coloured femora, and the white colouring of the precostal cell—a character not met with in the females of *ORNITHOPTERA* or indeed of the other genera, except *DRURYA* where the femora are yellow as in the ♂ of *Paradisea*.

* The Dutch Entomologists of De Haan's time used a different nomenclature for the veins of the wings, than that now adopted. Thus, the costal nerve of the lower wing would be the 1st vein; the 1st and 2nd subcostal branches would be the 2nd and 3rd veins; the discoidal nervule the 4th; the 1st, 2nd, and 3rd median branches the 5th, 6th and 7th; and the submedian nervule the 8th vein; the subcostal nerve was called the upper middle vein; and the median nervule the lower middle vein; a similar arrangement applies to the upper wing.

* The outline of the anterior wings of *Paradisea* remind us of those of the beautiful chalcosiid moths of the genus *HISTIA*, which are generally very triangulate, and narrow in comparison with their posterior wings, while the latter in some examples or species of the genus are more closely represented by the form of the hind wings of *Tithonus*. It may be mentioned that *Histia* is Papilionoid in appearance.

All things considered then we are justified in placing the members constituting the genus *SCHOENBERGIA* immediately preceding *ORNITHOPTERA*.

I now proceed to describe the beautiful examples from which I have drawn the plate.

♂. Primaries with costa rather more arched than in *Paradisea*, the posterior margin slightly concave, without dentations, inner margin gracefully curved; wing velvety black; with 3 very irregular-formed golden-green bands:—the 1st, under the subcostal nervure commences at the base as a fine line of green atoms, widening as it advances towards the apical angle till it becomes a broad patch, occupying most of the area bounded by the 2nd and 5th subcostal nervules; the 2nd begins within the discoidal cell narrowly at a junction with the base of the 1st median branch, and broadens somewhat along the median nervure, forming a junction with the large irregular-shaped discal patch, from which it is only divided by the median nervure, the submarginal portion terminating in a thin transverse streak at the 2nd discoidal nervule; the discal area thus occupied includes nearly half the space between the 3 median nervules and the submedian nervure, the upper portion being slightly excised by the black; the 3rd green band runs from the base along the interior margin about 2-3rds between the margin and the subcostal nervure, but becomes narrower as it approaches the anal angle; midway of the 3rd, 4th, and 5th subcostal internervular green spaces are 2 small elongate golden spots, the upper one much the largest; the edges of all the green bands are softened by golden-green atoms, and all the 3 green bands become gradually more golden towards the hind margin. On the under surface the greater portion of the wing area is golden green, with a narrow black hind margin; the costal and subcostal space is brownish black, as is the inner margin as far as the submedian nervule, the black forming a curve or arch from the base to a submarginal black spot with which it coalesces; there is also a submarginal row of 4 other black spots in the green; the green occupies the greater part of the cell to nearly 5-6ths from the base, and is encroached upon in the upper part of the cell in a curved line by the black; a large black transverse patch, strongly indented on both sides occupies the distal end of the cell, and more or less space outside from the 4th subcostal to the 1st median nervules; a small green spot is close to the median vein between the 2nd discoidal and 1st median branches; a longitudinal green apical mark almost united by green atoms with the discal green area, a 2nd smaller submarginal is between the 4th and 5th subcostal branches; an elongated golden spot also in the green between the same nervules, and a thin golden stripe between the next nervule below. The veins are all well expressed in the green; but on the upper surface they are practically invisible in the black, though obtrusive on the green, so far as the median vein is concerned.

Secondaries, smaller in proportion than the primaries; suboval in form, the curvatures of all the margins being exquisitely graceful; the abdominal margin is sharply divided by the median fold, and excised as in *Paradisea*, the silky buff fold curved over on to the black in the most delicate and graceful manner, with very long buff-coloured hairs, nearly as extensive as in *Paradisea*; the wing is silky golden 3-4ths of the cell from the base, with a narrow margin of green; the greater portion of the disc from the subcostal to near the 1st median nervules the same silky golden, as is also a broad subanal patch between the 2nd discoidal and 2nd median branches; a

submarginal band commences at the anal angle, proceeding to the apical, and encroaching by deep convex lunations into the golden between the submedian vein and 1st subcostal branch, also between the 1st and 2nd, and the 2nd and discoidal nervules, each lunation containing an orbicular black spot, whereof the upper one is the largest; the posterior margin is narrowly black, as is also the whole of the submedian space, with a congeries of golden green atoms midway near the median vein; all the black with its edges softened into the golden green by atoms of golden green. Undersurface similar to above except that the 3 discal suborbicular black spots are rather larger; and there is an ovoid black spot on the green at the end of the cell, a cuneiform black spot between the discoidal branch and the 1st median, and a black stripe between the 1st and 2nd median nervules; the submedian space is green, with a short black stripe from the base nearly to where the 3rd median branch begins, and the costal margin black, with a stripe of green atoms extending from half way to the apical angle; the underside of the abdominal fold is greyish-buff and silky, with a dense fringe of light-sienna hairs, lighter at near the anal angle, which nearly encloses the abdomen when the insect is in a state of rest; the nervules all very delicate and most gracefully curved, the distance between the 2nd and 3rd median branches being very narrow; the posterior margin forms a very narrow black line; base of the wing black, but the precostal cell is yellow on both surfaces.

Head, antennæ, thorax and legs velvety black; eyes brown black; thorax with pectoral red spots; femora probably black *instead of yellow* as in *Paradisea*; abdomen very silky golden yellow, with a silky bottle-green dorsal stripe, suffused in the yellow from the 2nd to the 6th segment; the basal or 1st segment, black, with a central yellow silky spot; subdorsum pale yellow, with large lateral black dots; anal valves golden yellow, with the usual anal black mark.

Thorax with head, 10 mms.; antennæ or abdomen 16 mms.; costa 74 mms.; posterior margin 50, and interior margin 36 mms.; width of wing 40 mms.; width of hind wing (not including the abdominal fringe) 24 mms.; length 51 mms. Legs too imperfect for measurement.

Hab.: Waigeu, or Waigiu.

♀. Form, (outline) and colour of the wings similar to those of *Paradisea*. Primaries in colour and markings resemble *Paradisea*, except that the white discocellular patch is larger and squarer, though of irregularly indented outline,—the rest of the white markings are larger or longer than in *Paradisea*, and instead of 2 small discal white marks (as in *Paradisea*) there are 4 in the internervular spaces between the 2nd discoidal branch, and the submedian fold (or sinus), the 1st and 4th being small, and the 2nd and 3rd much larger,—the submarginal band of spots and markings are 9 in number instead of 8 as in *Paradisea*, and the lower 5 are lunate,—a white streak is between the 2nd and 3rd subcostal branches, all the white marks are colder in tint than those of *Paradisea*, and the marginal ends are modified in tone by myriads of dark scales—whereby the lunate spots are thus made grey. Undersurface almost entirely as above except, that the white markings are somewhat creamy in tint, and are not dusted with dark atoms, and the black parts of the wings are warm sepia in tone.

Secondaries resemble those of *Paradisea* except that the discal area of grey white is 1-4th larger, and encroaches a little way within the discoidal cell, the outline of its upper part being very irregular in curvature and excision, —the narrow portion between the 1st and 2nd submedian branches suggesting an inverted cornucopœa,—the short discoidal nervules are very black and distinct, all the other veins running through the black only faintly visible, except towards the posterior margin; in the grey area are 5 suborbicular black spots, all of them large, but the 1st and 5th are ovoid and larger than the other 3; just above these the grey begins to be dusted with dark scales, and below them densely with black scales and atoms on a brown-ochreous ground, rather yellower on the cornucopœoid division; there are 2 small yellowish subapical spots, the lowest nearly united with the cornucopœoid mark, the other close to the costa above it. The under-surface almost entirely the same as above, except that the light discal area has no dark dustings, or only at the edges of the black marginal band, and below the suborbicular black spots the spaces are pale chrome yellow; there is an irregular-shaped spot of yellow atoms at the apical angle; all the veins are prominently seen on the black, which is not the case on the upper surface; the precostal cell is yellow (in *Paradisea* it is white). The white marginal fringe lunules very obscure.

Head, antennæ and thorax black; eyes dark castaneous. Thorax with large pectoral red spots except near 1st pair of legs; dorsum of abdomen grey, and subdorsum yellow; the dorsum with lateral rows of minute black twin dots, subdorsum with the usual lateral row of black dots; the articulations well expressed by black, the penultimate segment orange yellow, as is also the anal fringe.

Head, with thorax, 10 mms.; antennæ or abdomen, 32 mms.; costa, 93 mms.; posterior margin, 61 mms.; in-

terior margin, 39 mms.; width of wing, 52 mms.; width of secondaries, 40, and length 63 mms.

	(1st pair: femur, 11; tibia, 9; tarsi, 11 mms.
Legs	2nd " : " 12; " 12; " 15 "
	(3rd " : " 13; " 13; " 19 "

Articulations of antenna, 54.

The femora appear not to be white as in *Paradisea*. The form of the protarsus and short length of the other 4 tarsi are exactly as in the ♀ of *Paradisea*.

Hab.: Waigau or Waigiou.

I am indebted to the liberality of Mr. H. GROSE-SMITH for the loan of the two examples of this superb species from which my figures are drawn.

The neurulation of the ♀ of this species is somewhat like that of *O. Priamus* and some of its allies, but in both sexes the position and starting points of each subcostal nervule differs a little from those of *Priamus*, and also from those of *Paradisea*, though I have no doubt of its congeneric relation to the latter.

I would suggest that the absence of the stigmatic brand in this genus is in some way compensated for by the presence of the abnormally long abdominal fringe in the ♂. I could give reasons for this, if it were necessary, but reserve them for the present.

The Hon. W. Rothschild points out in his *Novitates Zoologicae*, vol. II., p. 196, that in the ♀ "the number and size of the white spots of the fine wings are inconstant; the markings on the disc behind the cell are especially liable to obliteration. The white, internervular, marginal fringe is often much reduced."

SCHOENBERGIA GOLIATH.

Ornithoptera Aruana, var. *Goliath*, Oberthür; *Etudes d'Entomologie*, Livraison, xii^e, p. 2 (1888).

Ornithoptera Goliath, Oberthür; *Etudes d'Entomologie*, XIX^e. Livraison, Pl. 4 (1894).

Troides Priamus Poseidon (ab. i), *Goliath*, Rothschild; "Novitates Zoologicae," Vol. II., p. 190 (1895).

Although I regret that I have not had the opportunity of making a personal examination of the one example of this species at present known, which graces and enriches the collection of M. Charles Oberthür of Rennes, and am therefore unable to form so strong an opinion of its specific value and position as I otherwise might feel justified in doing; yet, through the courtesy of M. Oberthür, who, while fearing to entrust his priceless treasure to the possibilities of the post, very kindly sent me a good photographic representation of it, natural size, with some useful remarks, and later on a very exact lithographic figure (of the two surfaces) for my guidance, I am furnished with sufficient materials to guide me in an appreciation of its generic and specific value.

By the aid of these and the coloured plates in his *Etudes d'Entomologie*, [XIX^e. Livraison, Pl. iv.] and the accompanying text, I have ventured to draw my own plate, and to provisionally place this grand form in the position which it seems to me that it should occupy among the *Ornithoptera*.

M. Oberthür refers to the abnormal character of the supposititious var. of *O. Aruana* or *O. Pegasus* from Amberbaki, which Herr von Kirsch figured and described in the "Mittheilungen aus dem k. zool. Mus. zu Dresden, 1877: (Beitrag zur Kenntniss der Lepid.—Fauna von N. Guinea)" and of the interesting fact that he had himself received two examples which were so like it, and therefore sufficiently demonstrated its constancy of reproduction to justify him in describing them all as examples of a var. of *Aruana*, under the name of *Kirschi*. As these are all females, they may ultimately prove to belong to some species of which as yet the ♂ has not been discovered, or that some species of *Ornithoptera* is subject to dimorphism, which is highly probable. Oberthür then goes on to introduce a unique insect which he had subsequently received, a ♀, remarkable for its immense size, and appearing to be an aberration of *O. Aruana* also, which he appropriately names *O. Goliath*, thereby placing *Kirschi* and *Goliath* close together as vars. of *Aruana* or *Pegasus*.

But a first careful observation of M. Oberthür's photograph, strongly inclined me to regard *Goliath* as the ♀ of a species considerably removed from either of the examples of *Kirschi*, and a subsequent study of the photograph and M. Oberthür's plate has convinced me that we have here a species of which the ♂ has yet to be discovered, and which must, for the present, be placed in the genus *SCHOENBERGIA* after *Sch. Tithonus*. The reasons for this proposal are given below.

Mr. Rothschild, after his examination of the photograph, in a letter to me, pronounced the form to be an aberration of *O. Priamus*; but since then, in his paper on

the Eastern *Papilionidæ* ("Novitates Zoologicae") he has catalogued it as a var. of *O. Poseidon*, just after the var. *Kirschi*.

The following is M. Oberthür's diagnosis:—

♀. "Les ailes supérieures de ce Papillon immense sont presque entièrement noires, les taches blanches ordinaires étant très réduites. Au contraire, les inférieures sont largement envahies le long du bord extérieur par une seule grande tache confluyente blanc jaunâtre, saupoudrée d'atomes noirâtres et au milieu marquée de quatre points noirs ronds.

"Les yeux sont soulignés par un bordure de poils d'un blanc pur, ce qui donne un aspect étrange à la tête de l'*Ornithoptera Goliath*."

♀. The anterior wings of this immense butterfly are almost entirely black; the ordinary light bands are very much reduced in length. On the contrary, the posterior wings are largely invaded from the outer marginal band by one very large confluent discal area of yellowish-white (only divided by the veins), and powdered nearly all over by blackish atoms, and marked in the middle by 4 sub-orbicular black spots (the first of which is the largest). The eyes are underlined by a border of pure white hairs, which give a strange aspect to the head of *O. Goliath*.

To this description, I may add the following remarks, based upon the study of the photograph and M. Oberthür's coloured plate:—

The wings appear to be a very dark warm brown on both surfaces; the light spots or marks on each of the anterior wings are 12 in number—namely, the moderate sized discocellular transverse spot, which is almost straight on the side nearest the base, and so strongly dentate as to be nearly divided into three sections by the pseudoneura on the distal side of the cell: the 4 subapical marks are dentiform and very short; one suborbicular spot on the disc and six submarginal spots are small—the lowest a mere light streak: all these are ochraceous grey or white; on the under surface these spots occupy relatively the same positions, but are slightly larger in size, and not quite alike in form, while in addition there are two other light marks on the disc—one cuneiform mark of moderate length between the 1st and 2nd discoidal nervules, and one almost obsolete spot between the 1st and 2nd median nervules: all these are ochraceous yellow-white. The large confluent light band on the upper and under surfaces of the posterior wings are almost exactly similar in extent and outline, rather yellower on the underside. The abdomen is ochraceous white; the thorax dark brownish-black, and very velvety,

with pectoral red spots as usual; the head broad, the eyes warm dark brown, with broad light borders rendering them very prominent, just as in the two sexes of *Paradisea*; but the precostal cell is not light coloured as in *Paradisea* and *Tithonus*. The abdomen in shape and relative length more closely resembles those of the above species than that of *O. Priamus*, and is rather auburn in colour. Altogether, if we may judge by this one ♀, we have a species transitional between the two genera SCHENBERGIA and ORNITHOPTERA. But I am unable to recognise any close relationship to *O. Pegasus* or *O. Aruana*, or the fine vars., one of which Mr. Oberthür described under the name Kirschi. A comparison of the three forms in the plates originally published will justify my contention.

The length of the costa of the anterior wing in a right line is 125 mms.; of the posterior margin, 85 mms.; of the interior margin, 69 mms.; of the base, 8 mms.; or a marginal linear extent, (allowing for the curvature of the costa, which adds 8 mms. more to its real length), of 295 mms. or over 12.75 inches. The length of the costa of the posterior wing is 71 mms.; of the posterior margin, 58 mms.; of the interior or abdominal margin, 69 mms.; and of the base, 6 mms., all of course subject to a very great augmentation if the linear value of the curves were

taken into account; the greatest width is 60 and the greatest length of the wing 87 mms. The costa of the anterior wing of this species is therefore 22 mms., or about 7-8ths of an inch longer than that of the largest ♀ example of *O. Priamus* figured on plate 1A of this work, and nearly as much longer than the costa of *D. Antimachus* to be found on Pl. II. The length of the abdomen is 41 mms.; the antennæ are of the same length; the thorax with the head 27 mms.

Habitat: New Guinea, the home also of *Paradisea*.

The position assigned to this form, which is at present the only example known, can at the best be only provisional. A discovery of other ♀♀, or still better of the ♂ may completely falsify all our conjectures, and even give us a male unlike either *Paradisea*, *Tithonus*, or *Victoria*, although I can hardly anticipate that it will resemble *Priamus*.

This example of M. Oberthür's is very ragged at the outer margin of the wings, and it is impossible to say whether it has any light fringe lunules or not. Mr. Oberthür in a letter informs me that the femora of the legs are not white as are those of *Paradisea*; but neither are they in either sex of *Tithonus*.

ADDENDA TO PAGE xii.

The following beautiful varieties of the ♀ of *Schoenbergia Paradisia* have been discovered since my Plate IV. was published. The types of these varieties are in the exceptionally rich museum of Mr. Rothschild, at Tring,

who described them. Figures of these varieties will be found on Pl. IVA of this work. All these figures are drawn from Mr. Rothschild's types.

1. *Schoenbergia Paradisia*, V. *Meridionalis*.
Troides Paradiseus Meridionalis, Rothschild. "Novitates Zoologicae."

♀ Primary wings intensely black-brown and velvety. The disco-cellular mark intensely white, with a faint bluish tinge, occupying rather more than 1-4th of the cell—the inner edge nearly straight, though slightly undulate, the outer edge with a deep indentation by the black of the wing; not graduated by dark-brown atoms as in the normal form in Pl. IV. The outer marginal band of spots—whereof the first 3 are large and only narrowly divided by the 4th and 5th subcostal nervules: the next two smaller, wedge-shaped, and farther apart, entirely subdued by atoms or scaling: the 6th and 7th still smaller, and the 8th and 9th smallest of all—these are all subdued by the atoms; two large discal bluish-white marks between the 1st and 3rd median nervules, and a small, narrow, elongated white mark just below the 3rd median nervule; a faint clouding of bluish-white atoms in the cell, extending from the base to the white discocellular patch, on the upper part of its area. Secondary wings deep velvety brown-black; a discal area of bluish-white and vivid golden-yellow, very narrow at the costa, but so broad towards the inner margin as to almost fill up the entire space between 4 of the nervules and the lower 4th of the cell, extends from the anterior to the anal angle, and contains 5 suborbicular black spots—the 5th on the

abdominal margin being the largest—and confluent with a black streak without the submedian nervure. All the light space *above* the black spots is white, almost untouched by dark atoms; below them the yellow band is so subdued by a dense scaling of brown atoms, except on the two upper divisions, as to present almost a dull olive green tint. The black marginal border is rather broader than in the normal form. Under-surface similar to the upper, except in the presence of a white narrow scaling between the 1st and 2nd, and two narrow white patches of scaling between the 2nd and 3rd subcostal nervules, and that the yellow and white portions of the secondary wings are very pure in colour.

The abdomen is greenish-yellow above—more golden-yellow below.

Length of Costa, 79 mms.; greatest width of wing, 56 mms.; width of hind wing, 31 mms.; length, 51 mms. Length of abdomen or antennæ, 32, and of thorax with head, 18 mms.

Hab. Mailu, British New Guinea.

2. *Sch. Paradisia*, V. *Flavescens*.
Troides Paradiseus Flavescens, Rothschild.

♀. Anterior wings very dark velvety black, with a faint purplish blush viewed obliquely; the discocellular white patch occupies less than 1-5th of the cell, and is very irregular in shape, slightly scaled at the outer edge, and graduated to the black by a slight clouding of grey atoms on the upper inner part of the cell; all the 9 submarginal light marks, except the upper three (and these partially), are subdued by grey atoms or scales more like those of the type form, as are the 2 discal small white spots. Posterior wings velvety black; the light area not quite so extensive in proportion as the previous variety, and nearer in outline to the type form; the light area does not invade the cell: it is creamy white, with the veins running through it very yellow; the 5 black discal spots are much larger than in the type form—4 of them being almost leaf-shaped—the 5th confluent with the black of the abdominal margin; the area below these spots is a rich golden-yellow, which also extends a little way above their apices, and to the apical angle of the wing, and is densely scaled with brown atoms except in the separate yellow spot near the apical angle. The black margin of the wing is about the same in width as in the type form. The under surface of both wings the same in colour, and almost the same in the shape of the markings, except that the colour is more rich and pure from the absence of scaling,—and the white is more

creamy in tone than in the previous variety. The marginal fringe lunules of the hind wings are formed by yellow atoms: of the fore-wings they are white as above.

Abdomen yellowish-white above; subdorsum deep greenish golden-yellow, with the articulations well expressed in black.

The costa of the anterior wing of this beautiful variety is much more rounded at the apical angle than in the type form.

Length of costa 95 mms.; greatest width of anterior wing 38; width of posterior wing 43, and length 63 mms. Length of abdomen 40; of thorax with head 21; of antennæ 35 mms.

Hab. Etna Bay, New Guinea. Etna or *Kiruru* Bay, as the native name is, is situated on the south coast of the Onin province of Dutch New Guinea, in 134° 30' East longitude, and about 5° S. latitude; and runs like a narrow creek into the land in an eastward direction probably about 15 miles from the mouth of the bay. On the eastern side of this bay is Mount Lakahia, nearly 4,600 feet high—itsself the most western member of the Charles Louis Range of Mountains.

♀. Anterior wing reddish brown; discoidal cell with the usual white mark, separated into too small elementary spots—the upper one being the largest, though only 1-6th the length of the cell, and slightly divided above, the lowest spot much smaller, at some little distance below the other, and little more than an aggregation of atoms; of the usual submarginal band of white marks the 4 uppermost are not as large and long as usual, the fourth being quite cuneiform, and all subdued somewhat by brown scales: the 5th is a mere nebulous speck: the 6th entirely absent: the 7th a small grey triangulate spot, and the 8th absent; there are also 2 discal nebulous spots between the 1st and 3rd median nervules, the lowest elongate and most distinct. Posterior wings reddish brown; the light area nearly the same in outline and extent as in the type form, creamy-white nearly entirely subdued by grey scales, which are denser and redder below the 5 suborbicular brown-black spots, so as to constitute a slightly warm grey band; the marginal brown border is rather broader than in the type form. Under surface of the anterior wings similar to above except that all the white marks are cream coloured, and more distinct, the two discal marks are much larger than above, and in addition to the first four marks of the submarginal band the lower four are present as small irregular cuneiform spots; the outer marginal fringe-lunules meet so as to constitute a creamy-white fringe, and the brown of the wing is of a lighter and warmer tint than above—the veins standing greatly in relief. The posterior wing has the dark area as dark or darker than

above, and the light area is pure reddish-white above, and light creamy-yellow below the orbicular spots.

The costa of the anterior wing at the apical angle is so rounded as to almost unite with the very abnormally rounded outline of the outer margin, presenting quite a distinct appearance from that of the type form.

The abdomen is a warm reddish-ochraceous white above—the dorsum being ochraceous-yellow; the legs with the femur the colour of the abdominal dorsum.

Length of costa 82 mms.; width of the anterior wing about 57 mms.; of posterior wing 36 mms.; and length 61 mms. Length of abdomen 34; of thorax with head 21; and of antennæ 31 mms.

This variety is a very remarkable one, both in its colour and outline; and may possibly ultimately prove to belong to a different, though closely allied species.

Hab. Erima. Taken by Dr. Hagen.

Erima, a little port of the Astrolabe plain, is situated on the N.E. of German New Guinea in Astrolabe Bay, in about 5° 10' or 12' S. lat., and about 145° 45' E. longitude.

The type is in the Tring Museum.

ADDENDUM TO PAGE xvi.

Schoenbergia Tithonus, De Haan type form (?), Rothschild.

♂. There is very little difference between the example figured on Pl. VI, and that on Pl. V, except in size. Of course the golden-yellow colour on the primary wings, if viewed in a very sunny light, is of astounding brilliance, heightened by the emerald green that shades into it from the base, and the intense velvety black, while the purely ochraceous golden marks of the secondary wings becomes intensely rich when viewed obliquely opposite the light; between the 1st and 2nd median nervules is a small elongate patch of black scales, and in the cell of the secondary wings at the distal end, is a similar nearly obsolete spot of black scales, which are not found in the figure on Pl. V. The under surface is almost absolutely like that on Pl. V, except that a slightly larger area of the cell of the front wings is occupied by the yellow and green.

Length of the Costa 72 mms.; width of primary wing 56; width of secondary wing 34; length 59 mms.; length of abdomen 41; of thorax with head 25; and of antennæ 36 mms.

Habitat. Kapaur, Low Country, New Guinea.

♀. Primary wings. The white mark in the cell is smaller in proportion and more dentate on the distal side than in the example on Pl. V.; the other white marks of the wing differ little from those of Pl. V. On the secondaries the light area is creamy white, and the yellow spaces below the orbicular black spots are a purer ochre subdued

by brown scales than in the fig. on Pl. V.: and the 4th spot from the apical angle is absent, or only faintly indicated on the right wing by two or three black scales; the light area also occupies 1-3rd of the cell instead of 1-7th as in the fig. on Pl. V. The under surface does not differ except in the increased brilliancy of the yellow on the posterior wing, and its freedom from scales. The dark part of the wings on both surfaces are brown-black with a greyish sheen.

The abdomen brownish yellow on the dorsum, and brownish orange beneath, instead of white and yellow as on Pl. V.

Length of costa 93 mms.; width of anterior wing 60; width of posterior wing 37; and length of wing 65 mms. Length of abdomen 35 mms.; of thorax with head 20; and of antennæ 33 mms.

Hab. The low country of Kapaur in Dutch New Guinea. Collected by Doherty. See figs. 1, 2 ♂, 3, 4 ♀, Pl. VI.

In the Museum of the Hon. W. Rothschild at Tring.

The fact that examples from Waigeu and New Guinea do not materially differ in pattern would seem to indicate that this species is pretty constant in its facies—perhaps perhaps more so than is *Sch. Paradisea*.

SCHOENBERGIA MERIDIONALIS.

Troides Meridionalis, Rothschild.

Since the article on page xix descriptive of Mr. Rothschild's *Troides Paradiseus v. Meridionalis* was printed, a marvellous ♂ form closely allied to *Paradisea* came to hand—a unique example of certainly the most extraordinary Ornithoptera or even Papilio that has yet been discovered. This butterfly was accompanied by another specimen or two of the supposed variety *Meridionalis* described on page xix.; and there could be no doubt that here were the two sexes of an entirely new species, whereby the ♀ would have to be raised from the rank of a variety of *Paradisea* to that of the consort of the new form, which will for the future be called *Schoenbergia Meridionalis*. It is highly probable that distinctive ♂♂ of one or both of the other ♀ varieties of *Paradisea* described on pages xix. and xx. may yet be found; but however peculiar their forms may be, they are sure to be allied to the type form of *Paradisea*. We need never to be surprised if new and wonderful butterflies yet are discovered in New Guinea, and its adjacent islands. It is a land of surprises in Zoological revelations. As will be seen by reference to the figures on Plate IVb, the most novel character of this insect is the peculiar and graceful form of the tail, which is quite unlike that of any other known butterfly or moth, and seems to suggest to us on a small scale one of the singularly graceful and delicate wiry plumes which adorn certain Birds of Paradise.

♂. Anterior wings sub-scalene-triangular; the posterior margin irregular in outline, proceeding convexly from the apex to near the end of the 2nd discoidal nervule, from whence it is slightly concave to midway of the 1st and 2nd median nervules, then convex to nearly midway of between the 3rd median branch and the submedian fold, from whence it is again concave to the posterior angle; the interior margin is nearly straight from the posterior angle to the base of the wing. The costa is strongly arcuate; the positions of the veins about the same as in *Paradisea*. Wings deep velvety black and golden green, the veins passing through black areas are invisible, those in the green are black and deep emerald green; a thin green costal line extends from near the base to not quite half the length of the costa; a golden green band, broad at the commencement near the apex, and gradually narrowing to a fine line to within about 5 mms. of the base—this band is broadly intersected by black so as to form a small green patch united faintly by green atoms to its band, and this band encloses the greater part of the 3rd, 4th, and 5th subcostal nervules and part of their parent stem, and a part of the band terminates within the discoidal cell; a broad area of golden green occupies the disc from the submedian nervule to the 2nd median branch, from thence as it proceeds up the wing becoming more restricted in width till it becomes narrow and irregular, is interrupted by the black and loosely united to the subcostal green band; a narrow, curved portion of this green area also encroaches within the cell over the median nervule—thereby causing the black to assume the form of a broad band almost in the middle of the wing extending from the base, through the cell, broadest towards the outer margin, and united with the black of the outer margin by the narrow line of black which divides the green costal band from the discal green area; the posterior

margin is broadly black from the apex to the anal angle, thence continuing 3-4th along the interior margin, but interrupted at 2-3rds of its length by a small golden green patch; the remainder of the inner margin to the base is a continuation of the discal green; all the black parts are softened into the green by black atoms or scales; *the outer-marginal fringe is a faint golden green.*

Summarised, the wing area may be described as consisting—(a) of a moderately narrow black subcosta, (containing a short green line) this black continuing down the submargin, and along 3-4th of the sub-interior margin, interrupted by one small green patch on that inner margin; (b) a green subcostal band, rather broken up at near the apex, where it is broadest, and diminishing to a thin line at near the apex; (c) a broad band of black nearly occupying the middle of the wing and slightly united to the submarginal band of black; (d) a discal area of golden green, from the base, slightly within the cell, and almost united submarginally with the subcostal band; the outer marginal fringe green.

Posterior wings: long and narrow; costa moderately arcuate; only 4-7ths of the length of the interior margin of the upper wing; the posterior margin strongly incurved, or concave nearly to the commencement of its caudal prolongation, proceeding the rest of the way to the anal angle beyond the tail as a more or less straight line; the abdominal margin somewhat convexly curved; the tail is a threadlike prolongation of the 3rd median nervule, with a small twisted leaf-like spatule, followed by a short hair-like point: the leaf-like spatule has the nervule passing through it like the midrib of a leaf. Colour of the costa, the base, the posterior margin (very narrowly), and a part of the abdominal margin to the submedian nervule golden emerald green—but the green only appears on the abdominal margin as stripes of green from the base continued by atoms within a longitudinal band of brownish black; a thin line of golden green is seen also outside the black, proceeding inward from the anal angle. All the veins are conspicuously a rich emerald green, faintly black near the outer margin, all narrowly bordered by emerald green; the precostal nervule and base partly black and partly green; the rest of the wing, *i.e.*, the cell, and the disc, are a semi-diaphanous silky yellow of intense brilliance—forming altogether by the intervention of the veins and 8 silky yellow divisions, large and small; the thread-like tail is bronze black faintly edged with green on one side; and the leaf-like spatula is emerald green bordered with the brown black, and slightly dusted with black atoms. The neurulation is arranged on a similar plan to that of *Paradisea*, only more exaggerated.

Under surface of the anterior wings: The upper half of the disc deep brown black, with a band of golden emerald green irregularly occupying portions of the inter-nervular spaces from the subcostal nervule to the 1st median nervule. This green area comprises 7 divisions or patches—the first being a thin subcostal line, the 2nd extending from the upper side of the cell half-way to the apex: the 3rd from the cell more than 1-3rd towards the apex, followed after a black interval by a narrow stripe

of green atoms: the 4th between the 4th and 5th subcostal branches more than 1-3rd towards the outer margin, and pointed at its apex, followed by a few bright green atoms on the black: the fifth along the greater midway portion between the cell and outer margin: the 6th and 7th are small submarginal adnervular patches; the other half the wing is bright golden green, including the greater part of the discoidal cell—the median vein, and its 2nd and 3rd branches being broadly bordered with black, and the submedian nervure also black, but not bordered with black; the outer and inner margins are narrowly black except at the upper half of the wing where it graduates into the general black area. Under-surface of the posterior wings as above, except that all the colours are, if possible more delicately bright, and that there is no black on the wing, except the faintly visible black nervules; and that the submedian and inner-marginal areas are pearly silvery grey, divided by a greenish line; a creamy-white fringe of very long hairs is attached to the sub-median fold, which when the insect is resting, covers on each side nearly the whole of the abdomen; the tail spatula is green, as above.

Head black; eyes, dark brown and prominent, underlined prominently with white; antennæ, black and long.

Thorax: above velvety black, with a central golden green corset-like divided patch, more beautifully formed than even in *Paradisea*; below this patch is a pair of triangulate green marks, their broadest above; the sternum with a small red patch near the base between the 1st and 2nd pairs of legs—with a slight patch of yellow hairs next the red, and towards the abdomen; the remainder of the thorax dark brown; the legs are ivory-black, the tibiæ especially being polished. The femora are normal in shape; the tibiæ are very broad, especially of the 3rd pair of legs, and strongly remind one of the tibiæ of some Hymenoptera; the tarsi are quite thread-like. Abdomen: golden lemon yellow, very delicate and bright; dorsum with a silvery grey longitudinal depression down the middle; the anal segment with the black subtriangulate mark over the valves rather more prominent than in *Paradisea*; the usual subdorsal black dots. The anal segment and valves resemble those of *Paradisea*.

Length of costa 59, of posterior margin 48, and of interior margin, 29 mms.; of posterior wing—costa 19, of posterior margin to the base of the tail 30, of the remainder of posterior margin to the anal angle $4\frac{1}{2}$, and of the inner margin 16 mms.; of the tail to the spatula 10 mms.; spatula 3 long, 2 wide; thread-like point of spatula 3 mms., or 16 mms. in all as the length of the tail; greatest width of the hind wing 15, least width, 5 mms.

Abdomen: length 30 mms.; greatest width 9; least width 5 mms.

Thorax and head, 20 mms.; antennæ 32 mms.

Legs, including the trochanters.	{ 1st pair, femur 10; tibia, 8; tarsus 13 mms.
	{ 2nd " " 11; " 12; " 15 "
	{ 3rd " " 11; " 11; " 15 "

Hab. Mailu, British New Guinea. (Meek). In the Rothschild Tring Museum.

POINTS OF DIFFERENCE FROM *Paradisea*.

- (a) Outline of anterior wing: *Paradisea* outer margin convex; *Meridionalis* irregularly concave and convex.
- (b) Outline of posterior wing: *Paradisea* outer margin begins convex, but towards the tail is more concave; *Meridionalis* very concave, and a straighter portion on the right side of tail.
- (c) Caudal prolongation of *Paradisea* long, narrow, and curved, but otherwise very Papilionine; *Meridionalis* thread-like, curved and flexible, with a green leaf-like spatula.
- (d) Posterior wing: outer marginal thin black border in *Paradisea*; green border in *Meridionalis*.
- (e) Abdominal margin: fold and area to the median vein black above in *Paradisea*; black and green in *Meridionalis*.
- (f) Thorax: corset-like green mark different in shape in *Meridionalis* from that of *Paradisea*; and with a pair of triangulate green marks below it in the former.
- (g) Abdomen: with black dorsal stripe, divided by white in *Victoria*; a dorsal silver-grey longitudinal depression in *Meridionalis*.
- (h) Legs: the femora yellow in *Paradisea*; black in *Meridionalis*; tibia, normal and black in *Paradisea*; ivory-like and very broad in *Meridionalis*; tarsi, sufficiently stout in *Paradisea*; thin and almost thread-like in *Meridionalis*.
- (i) The pectoral red patch only on the thorax of *Paradisea*; a yellow patch of hair-like scales follows the red in *Meridionalis*.

This species is less closely related to *Tithonus* than *Paradisea*.

SCHOENBERGIA TITHONUS.

♂. *V. Waigeuensis*. An example in the Tring Museum, with the discal spots of black on the posterior wings smaller than in the type form, the 1st spot being the largest. Also on the underside of the anterior wing the black internervular spots are very small; and all the posterior wing spots are smaller than in the type form. The cell in another example on the lower wing with a greater space occupied by the golden yellow.

[I must here ask the reader to refer to page xx., and in the "Addendum to page xvi., *Schoenbergia Tithonus*, De Haan type form (?) Rothschild"] to delete the "(?)" from his mind, as I find I misunderstood what Mr. Rothschild said about the locality from which he received this insect. The facts are that the Kapaur examples represent the typical *Tithonus* and the Waigeu specimen from which my Pl. V. was drawn, is a variety, (*V. Waigeuensis*). Mr. Rothschild assures me in a letter that Kapaur, on the mainland of New Guinea, is the exact spot where Solomon Muellen caught the type, now in the Leyden Museum.

GROUP II.



THE TRUE ORNITHOPTERA.

Genus. ORNITHOPTERA.

- Troides*, Hübn. Verz. bek. Schmett. 87 (1816).
Ornithoptera, Boisd. Faune de l'océanie, t. 4 f. 1 (1832).
 „ [Boisd. Voy. Astrolabe, Lep. p. 33 (1832)].
Amphisius, Swainson, Zool. Ill. 2nd Ser. t. 98 (1833).
Ornithopterus, Westwood, Introd. Mod. Class. Insects, V. II., p. 348 (1840).
Ornithoptera, Sp. Gen. I. p. 173 (1836).
 „ Doubleday and Hewitson, Gen. D. L., p. 5 (1846).
 „ Chenu, Encycl. d'Hist. Nat.; Pap. Diur. p. 33 (1856?).
Papilio (*Ornithoptera*), G. R. Gray, Cat. Lep. Brit. Mus. (1852).
Pachlioptera (part), Reak. Proc. Ent. Soc. Philad. III., p. 504 (1864).
Ornithoptera, Wallace, Trans. Linn. Soc. Vol. XXV. (1866).
Papilio, Kirby, Syn. Cat. Diur. Lep. p. 517 (1871).
Ornithoptera (*Subgenus*), Distant, Rhop. Malayana, text, Vol. I, p. 32 (1887).
 „ Fickert, Ueber die Zeichnungsverhältnisse der Gatt. Ornith. (1889).

Although the differences which obtain between the Linnæan Genus *Papilio* in its entirety, and Boisduval's *Ornithoptera* are not really very numerous (being by some regarded as most important in the larvæ), and have been by many authors deemed hardly important enough to justify their separation; yet the general and uniform divergence in superficial appearance, together with a special character in the ♂♂ which we shall have to notice later on, the peculiar colouration, and the remarkable shape of the hind wings of the ♂ in one division of the Genus, together with its almost unique splendour, and the gigantic size of its ♀—added to the fact that anyone could at a glance separate examples of either sex of the two genera, quite justified Hubner and Boisduval in removing the latter from its original position and giving it a new generic distinction.

Whether *Ornithoptera* should be regarded as a Genus or a Subgenus is a reasonable question, which can only be settled finally, when we know much more than at present of its internal characters, and the life history and variations of its larvæ. The structural characters of the wings and bodies differ but little from those of *Papilio*. Indeed Mr. Distant only allows it the lower rank; and while there is much to be said for his view of the case, it will be necessary to point out presently a special character, generally ignored, which we think ought to be taken into account in any diagnosis: this character is confined to the ♂♂ of the *Priamus* group, and as far as I can ascertain is not found in any others of the *PAPILIONIDÆ* unless in a very restricted sense. It disappears in the *Pompæus* group, from the upper wings, and in a new and more complicated form becomes a feature of the ♂ abdominal fold. In this position it is found also among a multitude of the true *Papilios*, most especially the ♂♂ of the black and red South and Central American group. In the latter the general shape of the wings of both ♂♂ and ♀♀ is even more suggestive of the *Ornithoptera*, than in an analogous case between the Asiatic *Neptis* and some of the American *Eresias*.

With regard to the rank of the *Ornithoptera* it is only their grandeur perhaps which may dispose us to give them their position at the head of the *Papilios*. If the *Pierinæ* are to remain as the 1st sub-family of the *Papilionidæ*, *Ornithoptera* might well take some other and even lower place in the 2nd sub-family; and in any case it seems to me that the Red and Black groups of *Papilios* and their

green allies should follow immediately after, as a genus or subgenus to which the name *Ornithopterinus* or *Ornithopterina* might be applied. We should then have two species of *Papilio*, which probably are closely related to *Ornithoptera*, namely *P. Zalmoxis*, Hewit, and *D. Antimachus*, Drury, both W. African forms, to find the true position of.

It has been suggested to me by Mr. Jenner Weir, whose knowledge is very extensive, that inasmuch as Hubner's name *Troides* is older than Boisduval's *Ornithoptera* the former should be accepted in place of the latter. But, although *Troides* is a post-Linnæan name, it seems unwise to bring back an almost forgotten name, as a substitute for one so universally accepted, and so much more appropriate to the character of the insects.

The diagnosis of the Genus by Boisduval being so brief, must be my justification for adopting that of Doubleday and Hewitson.

“Head large. Eyes large and round. Maxillæ of moderate length. Labial Papi closely pressed to the forehead, short, obscurely triarticulate, covered with long hairs, the basal and apical joints very small, especially the former, which is barely discernible.

“Antennæ very long [same length as abdomen], gradually clavate; the club arched, slightly tapering towards the apex [see Pt. Ia., fig. 5]. Thorax very stout, the prothorax very distinctly developed.

“Anterior wings powerful, elongate, triangulate; upper disco-cellular nervule about equal in length to the space between the two discoidal nervules; 3rd median nervule mostly thrown off exactly opposite the end of the cell [this varies in the different species from 1 to 2 mm. from the supposed normal position]; median and submedian nervures connected by a baseo-median nervule [generally of about 3 or 4 mm. in length]. Posterior wings small in proportion to anterior, sub-triangulate, the costa slightly rounded; the outer margin rounded, dentate; precostal nervure 2 branched, the inner branch bent downwards and united to the costal nervure.

“Legs strong, elongate. Anterior tibiæ with a very stout spur. Tarsi with the 1st joint about equal in length to the rest combined; 4th joint shortest; 2nd, 3rd, and 5th nearly equal. Claws, simple, strong.

"Abdomen elongate, stout, the last segment always furnished in the ♂ with 2 very large valves. ["These," Wallace tells us, "are very large, ovate (or semi-ovate), coriaceous (or leathery), and not hairy;" and, as Gosse points out, externally convex, internally concave; in some species, such as *Arruana*, being densely fringed with hair scales; but he considers that (for reasons I shall give in another section of this work) Ornithoptera is a good genus. The anal termination of the ♀ is generally a dense tuft of hair scales, varying much in the different species, and even individuals. These entirely hide the vulva, or act as a dense fringe when it is permitted to be visible, and extend entirely up the suture beneath to the next segment of the abdomen. They are generally darker, or, more ochreous in colour than in the other abdominal parts.]

"Larva tuberculate; the tentacula contained in a fixed bifid sheath.

"Pupa stout, slightly arched, tuberculate; head bifid."

"In the larva state they differ from *Papilio* in having an external forked sheath for the prothoracic tentacula. The perfect insects have the prothorax more developed; the abdomen larger, longer and very deeply grooved below; and the valves of the last segment far larger than in any species of *Papilio*. The larvæ resemble those of some *Thais* and *Papillons* in being tuberculated. The Pupa not surrounded by a transverse band, but sustained by a silken thread on each side, attached to a small lateral tubercle [Boisd. sp. Gen. i. 173]. Wallace remarks in reference to this, that his own observations on *O. Poseidon* show that the larva has no "external sheath" to the thoracic tentacles, and that the suspending thread passes round the pupa, and is not "fastened on each side to a silky tubercle." Drawings of these will be given in their proper place.

To the foregoing the following facts may be added:—

1st. The baseo-median nervule connecting the median and submedian nervures of upper wing, makes its appearance in an earlier family of the Diurnea, the Morphos, where in the Genus *Morpho* it may be found, almost hidden by scales; and that portion of it which joins the median nervure is bifid, each point united to the nervure by a swollen fraction of the membrane of the wing, the form of the whole being somewhat Y shaped. In *Caligo* it appears to be absent, the corresponding part of the submedian nervure curving up close to the median instead. I find no trace of such characters in other families of the Diurnea, though this is no evidence that they do not exist.

2nd. The Precostal nervure is bifid in *Ornithoptera*, and is found nearly of the same shape and bifid in the Genus *Caligo*, but not in *Morpho*. It does not appear in the sub-family *Pierinae*.

3rd. The spur on the middle of anterior tibiæ of front legs is stout and of equal width 3-4ths of its length, the remaining 4th being very sharply pointed. This spur is hollow. It exists in the ♂ and ♀ of all the sub-family *Papilioninae*. It can also be found more or less obscurely present in the *Hesperiidae*, of which in one species, *Ismene jupiter*, Fab., it is very prominent, and extends to nearly the whole length of the tibia. It can be traced among the Heterocerous Lepidoptera in *Castnia*, *Urania*, the *Sphingidae*,

and even in *Arctia*. Possibly it may be found in the majority of the lepidoptera, though often very rudimentary. In some a pair of very fine spurs take the place of the single one. These appear to be generally larger than their congener in *Papilio*.

4th. The great distinguishing superficial character of the Ornithoptera is really the singular sericeous patch on the Primary Wings of the ♂. This is only seen on the upper-side, and is a long pupæform mark, covered with scales of a different colour and character from those of the rest of the wing, extending from the 1st median nervule almost to the sub-median, and in width generally occupying about 2-5ths of the space between the median nervure and the Posterior margin of the wing. The shape of the patch slightly differs in each species, and indeed in the different specimens of the same species: a significant fact, as we shall see hereafter. This patch only appears in the *Priamus* group, that is to say, in the typical *Ornithoptera* and my section *Priamoptera*. Its effect is to bend or distort the 1st, 2nd, and 3rd median nervules midway: the first bending downwards, the other two upwards, this arrangement being constant in all the species. A slightly resembling character may be found in a similar position in some of the *Papilios*, notably *P. Ulyssis*; but it is absent in the subgenera *Pompeoptera*, *Trogonoptera*, and *Ætheoptera*, which I propose for the other groups of the genus, being replaced in two of them by an analogous character in the abdominal folds of the Posterior wings. In *Caligo automedon*, Cram., and *C. æsacus*, Herr Schaff, an analogous elongate-ovate patch is situated close to the submedian nervure, occupying half the space between it and the 3rd median nervule close on the edge of the abdominal fold, its length being nearly 1-5th of the length of the wing in *æsacus*, 1-7th nearly in *automedon*, and 1-4th in another sp. The colour of these is a sordid brown ochre till the pulvilli-like scales are worn off, as they generally appear to be when the insect has been long on the wing; and naples yellow beneath. Portions of the abdominal fold above and below in one species are of a shining creamy texture, as if irregularly changed by some fluid. The object or purpose of these ♂ marks is a study in itself. They are found as supposed scent-organs by Mr. Frederick Moore in many of the Euplæas. In the Pompeus, and Brookeana groups the abdominal fold of the ♂ contains a quantity of brownish or ochreous cottony material. Generally each fibre is longer and finer in texture than that mentioned on *Caligo*. It is quite concealed within the fold, and though attached to the inner surface, is arranged apparently in tufts or bundles, with the slightest adhesion, and quite invisible from the outside. Indeed it would be possible to possess long series of these insects, and never to discover the existence of this material, especially in such an insect as *Brookeana*. So closely is it packed, and so light and delicate are the constituent parts that when pulled out with a needle, it may be piled up to an extraordinary height upon the wing, so as to seem impossible that the fold could have contained such a mass. It is even more abundant in the ♂ of some of the Black and Red *Papilios* of S. America, evidencing their close relationship to the *Pompeoptera*. These peculiar characters are not entirely absent from the Heterocerous Lepidoptera; for, in one of the noctuid moths of the family of *Erebidae* in the author's museum, a peculiar fold or pouch is situated beneath the anterior wing, close to the submedian nervure and inner margin, just where the wing closes over the costa of the lower wing: this is filled with a mass of long pulvilli-like material.

5. The abdominal margin of the ♂ is fringed with long sienna brown hairs (often 11 mm. in length), which either fold over and across the abdomen, or laterally and nearly beneath it. In the ♀ these are not so long, and are darker. The breast of the two sexes of the typical Ornithoptera are ornamented with crimson scarlet spots or patches. The abdominal fold of the ♀ is always simple, and very hairy above; the portions of wing within the cell of secondaries and from thence to the fold is also furnished with long hairs over the brown surface, while the posterior margin of the Primaries is generally strongly fringed, especially nearest the base.

The markings on both surfaces of the wings of each sex are often very asymmetrical, especially in the ♀, and very variable in form and number; and while in the ♀♀ no two specimens of the same species can be found exactly alike, it is difficult to meet with a specimen in which the markings are exactly alike on both wings, or, in some cases, the same in number. The spots on under surfaces of the hind wings in the ♂ are also remarkably irregular on the two sides. The species of the typical group, with certain well marked exceptions, very closely resemble each other, except in size, in each sex; and we think it would be possible to find only one or two true species, as actually existing, if we could get together a sufficiently extensive series of each local form for comparison. Even the size of the examples of a species varies so much that a ♀ of *O. Richmondia* may be found as large as a ♀ of *O. Cassandra*; or a ♀ *Cassandra* as small as a ♀ *Richmondia*.

The browns and whites, or greys of the ♀♀ vary greatly in intensity from very light to very dark shades, and these also change with every alteration of position in light. The greens of the ♂♂ in each species vary in intensity from blue-green and emerald to a golden green and golden-green yellow; both blacks and greens are always shot with opalescent colours or reflections, ranging from purple to orange and copper, so that the ♂ of nearly every species, viewed very obliquely against the light looks absolutely like *Priamoptera Cræsus*.

The abdomen of each ♂ is of the richest yellow, with a longitudinal dorsal stripe of the same colour, but faintly orange, extending from the thorax to the anal segment. This is always easily discernible, and in each segment appears as if enclosed in sub-parallel lines of

lesser brilliancy, the lower part of each segment being somewhat broader than the upper—broadest half way up the abdomen, tapering off at the anal segment. The anal segment is also generally decorated with a triangulate spot of black, broadest at the top, and marking out the sutures of the anal valves; five or six black lateral dots are found on the abdomen, and sometimes more or less pale black cloudings. In the ♀♀ the abdomen is, of course, stouter, but not so long in proportion to the hind wings, generally an ochreous grey, with a dorsal black, or brownish longitudinal stripe or band; or in some species a deep grey black with darker and broader stripe, and always lateral dots midway between each segment; the subdorsal parts very yellow, the segments strongly accentuated with jet black; the anal valves with ochreous brown or orange scales.

The thorax stout; in the ♂♂ densely clothed with velvety black hairs, the ♀♀ with dark brown, the outlines of the tegulæ more or less visible, according to the condition of the specimen. A rich shining metallic green ray in the middle of the thorax, varying in length in the different species, and about 1-4th its width; in the ♀ this mark is narrower, not so long, often scarcely visible, and greenish yellow or greenish grey according to the species.

The length of the discoidal cell of the Primaries in the males is generally much more than half that of the wing—in the females nearly half the length; of the secondaries of the males 2-3rds, and in the females slightly less than half the length of the wings. The *Pseudoneura* or false nervures* which occupy the cell, are not so prominent as in the *Pompæus* group, and the arrangement slightly varies, the upper or 1st branch being rather shorter than in *Pompeoptera*.

The legs are relatively unequal in length: the length of the tibia of the first pair is about 1-3rd less than of the 2nd and 3rd pairs, which are approximately equal: the Tarsi are also proportionally shorter; but as species and even individuals vary in the length of the parts of each pair of legs to a measureable extent, this subject will be treated of in its proper place. The ungues or claws are simple, as in all the *Papilionidæ*. The haustellum or spiritrompe is of a moderate length, rather larger and more prominent than in the *Nymphalidæ*, and not hidden as it is in the latter by their large palpi.

* These are a system of lines, generally situated within the discoidal cells of the wings of most of the lepidoptera, sometimes beyond the cells, appearing in some genera as if they were actually branches of the true neurulation of the insect. In some genera they seem to be caused by simple folds or indentations of the membrane, though they are really visible on both surfaces; but in others, they are very strongly impressed, and still further accentuated by black scales along their entire length, often very broadly, so that the eye is almost brought to believe that they are real veins. Examples of this are found in the species of the *Pompæus* group of Ornithoptera. As these are all arranged according to definite laws, so that their position and special number is always constant in each family or genus, we thus obtain a series of subordinate characters of considerable importance. I think, which have been too much overlooked. I propose to call these *Pseudoneura* or false veins. Their number in the cells of the Ornithoptera and Papilionidæ is generally 4. These commence from a common stem at a point close to the base, and are almost arranged in pairs. One pair branches off at a 4th of the cell length from the base; these are of unequal length, the lowest curving towards the median and terminating at its juncture with the 2nd median nervures; the next terminates close to the 2nd discoidal nervule; the other pair sends one branch straight up the middle of the cell to curve suddenly to its terminal point at the commencement of the 1st discoidal nervule; the upper one is shorter (or the same length as the lowest), with its terminal point at the starting of the costal nervule; the two middle branches are of equal length, i.e. the whole length of the cell. The 1st and 4th are also equal, but only 2-3rds the length of the cell. Nearly midway between the 1st and 2nd discoidal nervules a new branch generally commences, bifurcating 4 or 5 mm. from the 2nd branch, and passing across the 2nd discocellular nervule, so as to bend it, extends from 1-3rd to half the length of the posterior margin of the wing. A strong false vein or fold again originates nearly at the base from the submedian nervule, and runs on midway between that and the median almost or quite to the hind margin of the wing. This is only on the Primary wing: the arrangements of direction in the cell of the pos-

terior wing is a little different. These discal *Pseudoneura* may be numbered 1, 2, 3, and 4, commencing from the top of the cell.

There are in addition to these the folds of the wing half-way between each nervule, commencing from the posterior margin and running inwards. These are often very strongly pronounced, and may possibly be intended to give flexibility to the wing: this arrangement however is not often found on the posterior wings. In the earlier families of butterflies, the *Heliconidæ*, and the *Nymphalidæ* the *Pseudoneura* are not so numerous or complex in the cells, two being the general number as far as I can trace them, though the hind marginal folds are always present. In the *Ithomiidæ* they undoubtedly exist, but are very difficult to see. They are less numerous in the *Bombycidæ* and some other moths, though often curiously arranged, and made to appear as branches of real nervures. Having examined several of the Hymenoptera in my museum, especially examples of the huge *Xycolopidæ*, or Carpenter Bees, and some of the *Tabanidæ* of the Dipterous order I find strong indications of a similar system, often of a very beautiful character.

Were it not that other orders than the Lepidoptera therefore possess these interesting arrangements, one would be disposed to view them as the remains of what in far distant ancestors were real veins, and of a rank nearly that of the simple ocelli to be found at the crown of the heads of most orders of insects, especially as in *Papilio* they became so suggestive of the more complex neurulation of the moths, from which probably some of the diurna have descended. But as it seems evident that in the Hymenoptera and Diptera the object to be attained is flexibility of wing, we must assume the same for them in the lepidoptera, a function somewhat similar to that served by the lines inside the human hand, and on the under parts of the human foot. There is one other possibility: a useful contrivance for facilitating the foldings of the wings in the chrysalis, though the latter is hardly probable. A careful examination of all the orders of insects, and family and by family in each order, would throw much light upon this subject.

This Genus may be usefully divided into 3 subgeneras and one section: the section will be part of the typical Genus *Ornithoptera*; will contain the golden and purple species, such as *Cræsus* and *Urvilliana*—insects very distinct in personal appearance from the green forms, but not sufficiently distinct to give them subgeneric value. This will be designated, *section* PRIAMOPTERA; the three subgenera are amply distinct from the typical *Ornithoptera*, and will be named, POMPEOPTERA (its type *O. Pompæus*); TROGONOPTERA (its type, *O. Brookeana*); and ÆTHEOPTERA (type *O. Victoria*). The characters of each will be given in their respective places.

In the section PRIAMOPTERA, *O. Cræsus* will be the type, as the difference in colour from *Ornithoptera* on the under surface is much greater than in the case of *Urvilliana*. The latter is nearly normal with the Generic forms, while the colour of the former is nearly as golden below as above. Possibly, however, they are both local vars. of *O. Priamus*.

The type of ORNITHOPTERA will be, as it has ever been, *O. Priamus*, Linn.

ORNITHOPTERA PRIAMUS.

† *Papilio Priamus*, Linn., Syst. Nat. ed. X. 458. n. 1 (1758).*

† " " Mus. Ulr. p. 182 (1764).

† " " Syst. Nat. I. 2. p. 744 n. 1 (1767).

† " " Clerck, Icones, t. 17 f. 1 (1764).

" " Houttuyn, Naturl. Hist. I. 11. p. 188 n. 1 (1767).

" " Müller, Natus. V. 1. p. 565. n. 1 (1774).

† " " Cramer, Pap. Ex. I. t. 23. A.B. (1775).

" " Fabr., Syst. Ent. p. 446. n. 16 (1775).

" " Spec. Ins. p. 6. n. 21 (1781).

" " Jablonski, Natus. Schmett. I. p. 195. n. 1. t. 1. f. 1, 2 (1783).

" " Esper., Austr. Schmett. p. 11. t. 1. f. 1 (1784).

" " Fabr., Mant. Ins. II. p. 3 n. 28 (22). (1787).

" " Gmelin, Syst. Nat. I. 5. p. 2230. n. 1 (1790).

" " Fabr. Ent. Syst. III. p. 11. n. 32 (1793).

" " Donovan Ins. India. t. 3 (1800).

" " Thunberg, Mus. Nat. Ups. XXIII. p. 9 (1804).

" " Turton, Syst. of Nat. III. p. 10. 2. tab. 65 (1806).

" " Shaw, Gen. Zool. VI. p. 207, t. 65 (1806).

† *P. Priamus* ♂, Godt. Enc. Méth. IX. p. 22. n. 1 (1819).

Troides Priamus ♂, Hubn. Verz. p. 88. n. 919 (1816).

Ornithoptera Priamus ♂, Boisduv. Voyag. Astrol. Lep. p. 33. n. 1 (1832).†

† " " ♂, " Sp. Gén. I. p. 173. n. 1 (1836).

" " ♂, Duncan, Foreign Butterflies, p. 89. t. 1. f. 1 (1837).

" " ♂, Blanchard, Hist. Nat. Ins. p. 420. n. 1 (1841).

" " ♂, Felder, Ver. Zool.-bot. Ges. Wien. XIV. p. 290. n. 8. 332. n. 7 (1864).††

† " " ♂, Wallace, Trans. Linn. Soc. Vol. XXV. p. 35 (1865).

† " " ♂, Chenu, Enc. D' Hist. Nat. Papillons Diurn. p. 3. f. 108 (by Lucas) (1856?).

" " W. F. Kirby: "Notes on the Butt. descr. by Linnaeus," in W. Ent. Soc. p. 134 (1870).

Pap. Priamus, Kirby, Syn. Cat. Diur. Lepid. p. 517 (1871).

O. Priamus, Dr. C. Fickert, Ueber die Zeichnungsverhältnisse der Gatt. Orn. p. 702 (1888).

† *Ornithoptera Priamus* ♂, ♀, A. Sidney Olliff, Austr. Butterflies, ♂. fig. p. 38** (1889).

[Many of these not marked with a † refer to vars. now called species.]

This is undoubtedly the type form of the whole genus, possibly the earliest known to authors; and though the figs. in the "Amœn. Academ." are so absurd, there can be little doubt that the insect was not far from the artist when they were drawn. At any rate they will do as well for this as for any species or var., which perhaps is not a great recommendation, though it is the best comfort that can be offered. The very close resemblance between the males of the typical groups of the genus may render it possible that Linnaeus' artist had seen some other of the many slightly different forms; but it is not probable. Since the time of the great Father of Entomology, such a multitude of examples and variations have been brought

before us, that the difficulty of deciding on the specific or varietal value of these has rather increased than diminished, although the tendency must be to more than ever regard them all as local forms of one species—some of these again being ranked as varieties of those local forms. The females, though they vary from each other much more than do their males, considering how wonderfully these variations pass almost imperceptibly into each other, rather strengthen this theory than otherwise.

But however we may view the case, there can be little hesitation in regarding the species of either sex of the typical *Priamus* as being fairly easy to recog-

* Linn. Pandora Insectorum, V. 5, 2nd Edit. 1788. Amœnitates Academicæ, t. 3, fig. 231-1-2, are 2 black figs. of an insect with pointed wings, suggestive of this species, but quite fanciful in execution and detail; evidently evolved from the artists' inner consciousness. In Edit. 1, Vol. 5, p. 3, fig. 203 (date 1758), these made their first appearance. The author has not seen this edition.

† A ♀ var. figured on Pl. 4 of the Ent., figs. 1 and 2, from Amboina and Rawak; and a ♀ var. from Celebes is nearly like that described by Boisduval, only the spots are larger and whiter, and there is a large transverse white quadrate spot in the discoidal cell. This should certainly be the ♀ of *O. Pronomus*.

†† Really the var. *Oceanus*.

** The ♂ only is really *Priamus*.

nise. The males are generally so much larger than their relations from other countries, with a distinct style of colouration and opalescent reflections, and their females are so nearly uniform in the absence of any white spot in the cell of the upper wing on either surface, or if one be present, in its being very small and central, that we seem to know it at once as *Priamus*, even if we are not informed its locality; and we never seem to obtain any specimens that are closely like it from anywhere out of Sumatra and Ceram.

The following from Linnæus will supply us with the earliest description of this species :

"*Alis denticulatis tomentosis supra viridibus: institis atris; posticis maculis sex nigra.* Vincent Mus. 10. *Papilio amboinensis viridi et nigro-holosericeus insignis.* Mus. petrop. 664. *Papilio Atlas Amboinensis alis superioribus holoserice nigris: institis viridibus.* Hab. Amboina.

"*Papilionum omnium Princeps augustissimus, totus holosericeus, ut dubitem pulchrius quidquam a natura in insectis productum.*"

[What would he have said had he seen the ♂ of *Æ. Victoria* ?].

"*Corpus 1: mæ magnitudinis. Caput et Pedes nigra. Thoracis latera lineis transversis coccineis. Abdomen flavissimum. Antennas non vidi.*

"*Alæ primores supra virides margine nigræ: macula nigra ovato-oblonga magna disci; subtus nigricantes: macula viridis parva duplicata in disco; macula viridis magna disci, versus marginem posticum, in qua Puncta 6 nigra oblonga.*

"*Secundariæ supra virides margine nigro: Maculæ 4 nigræ versus marginem posticum; macula fulva major, testa ab alis primoribus. Subtus virides margine nigro-dentato; maculæ 6 nigræ, rotundatæ intra marginem; macula fulva magis oblonga, ante primores; margo interior niger, lana ferruginea longissima.*"

Body of the first magnitude; head and feet black; sides of thorax with transverse scarlet marks. Abdomen intensely yellow. (Linnæus had not then seen the antennæ) Upper surface of the Primaries green bounded by black, with large black oval oblong spots, separated (beneath the disc). [This is the ♂ sericeous patch.] Under surface darkish, with a small twin spot in the discoidal cell (separated spot); large green divided patches towards the hind margin, in which are six oblong black marks. Secondaries: Upper surface green, with a black border; 4 black spots towards the hind margin, and a reddish yellow spot on the upper part of the wing. Under surface green with a denticulated black border, 6 black spots somewhat rounded within the border; and a large tawny yellow spot before the first of these; interior margin black, fringed with long ferruginous hairs.

The remarks and description of the species in the *Encyclopédie Méthodique* will be a fitting addition to the above.

"This *Papilio* to which Linnæus applied the epithet of *Auguste*, is, by reason of its beauty one of the first rank among those of the genus of which it forms a part. It is of a large size. The Primary wings are oval oblong, entirely of a heavy or dead velvety black on the upper surface, with two longitudinal bands of a golden green,

curved, narrow, contracting at each end. The anterior band extends along the side of the anterior margin to the top of the wing; the other extends the whole length of the opposite and the greater part of the exterior margins. Not far from the inner side of the latter, and equi-distant from the base and the extremity, one sees another brownish patch, large, disposed longitudinally. The under wings are rounded, dentated in an obtuse manner, of a golden green above, with the posterior margin of a velvety black, and preceded by a range of 4 orbicular spots of the same colour; independently of these it has 3 more spots of a shining orange yellow outside, of which the largest is situated towards the base, and the remaining two near to each other, at a short distance from the top of the anterior angle. The under surfaces of the anterior wings are black, with the spots of a golden green as above. These are 7 in number, namely, 1 irregular in the middle of the cell, and 6 much longer, arranged parallel with the posterior margin in a band which is divided by a black ray, transversely interrupted; near the top (of the wing) are 2 green longitudinal rays, of which the upper one is the longest. The under sides of the Secondaries do not differ from the upper, except that the black orbicular spots are larger, and number 7. The interior margin of these same wings is blackish in part, the other part being furnished between with silky brown hairs. The thorax is of a dead velvety black, with a green ray (longitudinal stripe); the two sides of the abdomen are of a beautiful yellow; the breast is black, with cinnabar red spots on each side; the head, antennæ and feet are black." Hab. Amboyna.

As the describer had not seen a ♀ of this species, he gives us no description; and even his ♂ appears as if it might have belonged to some other species.

There should be no difficulty in separating the type species from any of its congeners. It is nearly always several mms. larger in expanse than any of them—though small specimens may be met with; but the markings, colour, and general appearance in either sex are usually more nearly constant. The greens of the ♂ are deeper, with more rich coppery reflections when in good condition, and the discoidal cell of the ♀ is usually without a spot; or if there be one it is very small,—this applies to both surfaces of the Primaries; the ground colour of the ♀ is also either very dark brown, almost black, or very light; an example of the latter is given in Pl. 1b, figs. 3 and 4.

Donovan, in his *Nat. Hist. of Insects*, edited by Professor J. O. Westwood, has a fig. of the ♂ of *Priamus* settling on a *Mimosa Grandiflora*. The markings are very diagrammatically and neatly drawn, without much characteristic detail, though with great power. Of course the underside only is shown. It was from a specimen originally collected by one of the Dutch Governors of Amboyna. The expanse was $8\frac{1}{2}$ inches.

The ♀ var. figured in the *Voyage of the Astrolabe*, Ent. pl. 4, figs. 1 and 2 as from Celebes is not *Priamus* at all, but the ♀ of *Pronomus*, as may be seen from the presence of the large transverse subquadrate spot of white in the upper discoidal cell.

On Plate 1a of this monograph will be found four figures of the ♂ *O. Priamus* to which I would add the following information:—

Primaries. Costal green band, which changes a little in shape or width in different examples, as is the case

in all the species, prolonged nearly to the apex, and more pointed than in *O. Cassandra*; divided at the base by a broad black line (an exaggeration of the nervure), though not so much as in *Cassandra*. In the latter and in *Richmondia* it sometimes broadens out, and even divides almost into a separate patch at the apex.

Secondaries. With 4 black spots on the upper, and 6 on the under surfaces. On the upper, between the 1st and 2nd subcostal nervules and below the black spot is a minute golden yellow dot, similar to a large spot on the under surface between the costal and subcostal nervules. The corresponding position of a large black spot, which is immediately near this latter, is on the upper side of the wing green, but the yellow patch is repeated, though hidden by the Primary wing in its set position. The 4 spots on the upper side are smaller and more regular in form (sub-oval) than the 6 on the under side. A thin longitudinal ray of black atoms is situated between the submedian nervure and the 3rd median nervule, and from this point upwards the green becomes more golden, extending laterally to within the cell. The black outer border is broader on the underside than in the upper. Between the 2nd subcostal and discoidal nervules it sends up a tooth-like broad patch that coalesces on one wing with the black spot; and in the nervules below it is not so prolonged or scalloped; the lower branch of the pre-costal nervure, median nervure and its branches are nevertheless covered with golden scales or atoms, in the former making it very prominent in the dense black; the costal, subcostal, and branches are more or less densely and broadly black, causing them to appear of double or treble thickness; the abdominal fringe is of a light burnt Sienna colour, more like human hair. On the under sides of the wings, all the greens when viewed obliquely, appear of a rich shot purple and gold, impossible to represent with the brush. The upper sides are very opalescent in certain lights, coppery in parts, a very warm green opposite the light, absolutely like *Priamoptera Cræsus* in a very oblique position, and of indescribable beauty.

Thorax. The red on the sides does not occupy so much space as in some sps., and, as in the case of *Cassandra*, is only faintly indicated behind the 3rd pair of legs.

The length of the central green ray on the upper side of the thorax is 9 mm. Abdomen, brilliant greenish lemon yellow; 1st segment black except for a raised subtriangular yellow spot above, in the upper portion of which may be discerned 2 black specks, placed like eyes; the anal segment (or anal valves) with a triangulate black spot, flanked on the upper part by dark spots; subdorsal slightly more ochreous yellow, and with minute lateral dots on each segment. Abdominal fold, light pearly brown. Eyes, dark brown.

Primaries: length of costa 90 mm.; width 45 mm. Secondaries: length 55 mm.; width (including abdominal fold) 39 mm. Width of abdominal fringe 7 mm.; length of the fringe-hairs 7 mm. The abdominal fold extends from near the base to the end of the anal angle. Length of the thorax and head 23 mm.; width 13 mm. Of antennæ and abdomen respectively 36 mm.

Length of Legs:

1st pair: femur and tibia 15 mm. each; tarsi 11 mm.
2nd " : " " 15 mm. each; " 17 mm.
3rd " : femur 14 mm.; tibia 17; tarsi 20 mm.

Hab. Amboyna. In the collection of Mr. Oliver Janson.

On the Plate 1b will be found two figures of the ♀ (figs. 1, 2).

Primaries:—Upper surface dark silky warm brown, darker at the hind margin outside the white spots, also at the base; the whole in certain lights slightly coppery; the *Pseudoneura* faintly distinct; the discocellular nervules, with the adjacent sections of the median and subcostal nervules and nervules silky black; the rest of the neurulation the normal colour of the wings, though prominently shown; spots and marks a soft faded white, the lower ones darkened by brown scales of great beauty of form; the space above and below the internal nervure with darker brown hairy scales.

Secondaries, a darker smoky silky brown, a little lighter within the cell. Neurulation only slightly blacker. Abdominal fold and almost the whole of the upper part of the wings with long silky brown hairs; the light acuminate marks rendered very brown by the brown scales on the portions above the central black spots, and very dark warm brown beneath them by the density of these scales. The spots enclosed by the acuminate patches have a central darker brown spot in each, seen best in certain lights. Under sides rather lighter in corresponding dark, and darker in corresponding light parts. White markings of upper wings pure, not modified by brown scales; on lower wings soft ochreous white, with some delicate lemon yellow suffusion on upper marks; marks below the central black spots with brown scales grouped from the border upwards; the brown black spots with centres darkest; a few silky golden brown hairs within the cell and submedian nervure.

Thorax with much red beginning at Pro- and ending at Meta-thorax, also following the lines of the femur of two hind legs, with a spot on the front extending nearly to the pronotum, and encroaching of the base of the wings; above very hairy, dark brown, almost black, with greenish grey central stripe.

Eyes dark brown. Abdomen yellow ochreous, dorsal part soft greyish ochreous white; anal valves more ochreous, under side with brown-ochre scales; subdorsal primrose yellow; articulations well accentuated by deep lateral black dots.

Length of costa 160 mm.; breadth 54 mm. Secondary: length 70, breadth 48 mm. Antennæ and abdomen 37 mm. each; thorax and head 27 mm.; width of thorax 13 and of abdomen 13 mm.; of discoidal cell 17 (in the ♂ 15) mm.; the 4th division of the subcostal nervure 7 (in the ♂ 4) mm.; length of the 2nd, 3rd, and 4th division of the same 21 (in the ♂ 18) mm.; and of the 1st, 34 (in the ♂ 33) mm., or a total of 55 in the ♀ and 51 in the ♂; articulation of the antennæ 58 or 60 in the ♀, 48 in the ♂.

Hab. Amboyna. In the Coll. of Mr. Oliver Janson.

In figures 3 and 4 of Pl. 1a, a var. of the ♂ is given in which the oval oblong black spots on the upper surface of the Secondaries are larger than in the preceding; there is no yellow dot beyond the upper or first black spot: the border is more regularly scalloped inward with black: and the costal band of the Primaries is of a more equal width to its whole extent, while the green is a brighter golden on all the wings. Several differences may be also observed on the under surfaces, and notably the bluer

efflorescence of the greens, especially in the lower cell and beneath. The form of the upper discoidal green patch is more compact, and there are 2 golden yellow dots on the upper parts of the Secondaries midway of the black spots and the border. Length of costa 95 mm.

Hab. Amboyna. In the Museum of Mr. F. Horniman.

Fig. 5 of the same plate gives a front view of the head of the ♂ much enlarged, with the haustellum as it appeared rolled up. The latter, in another plate will be characteristically drawn. Figs. 1a and 3b, represent the exact shape of the sericeous brown patch of each specimen.

Plate 1b, figs. 3, 4 exhibit portraits of a much lighter var. of the ♀ of this species, with the abdomen more green, and the Thoracic stripe olive green. The *Pseudoneura* are more strongly marked; the oval oblong spots within the white marks of the Secondaries above are lighter, with darker and well defined centres: the outer borders on both surfaces darker, on the under side reflecting white efflorescence. The white on the under side of the same wings much purer; the base of all the wings less dark on both surfaces, and the brown of the thorax on under side lighter. The shape of the spots on the upper wings differ also considerably.

Length of costa 104 mm. Hab. supposed to be Amboyna. In the Museum of Mr. F. Horniman.

A ♂ in the Hewitson Coll. is, on the underside of the Secondaries between all the nervules dusted with rich umber or ferruginous atoms, most densely between the costal nervure and 1st sub-costal nervule, and the 2nd sub-costal and the discoidal nervules. The cell is only slightly affected. On the Primaries, under side, the 1st and 3rd green patches are also dusted, graduating downwards into a rich golden green. This is altogether a remarkable variety. The upper side does not differ from

the ordinary appearance. Length of costa 93 mm. Hab. Amboyna and Ceram.

The corresponding ♀ is of a warm umber brown, very rich in tone: the spots on the upper side not very large, and differ very little from those on the wings of Brit. Mus. specimens, except that the white outer marginal spots on the Primaries form an uninterrupted curved line, and the white mark between the 1st and 2nd discoidal nervules is divided equally by brown into 2 quadrate spots; and a faint indication of a white atomic ray is on the upper side of the discoidal cell, following the direction of the central of the *Pseudoneura*. The abdomen is ochreous drab white.

Length of costa 105 mm. Hab. as of ♂.

Cramer figures a ♂ with the 4 black spots; and with 2 golden dots, and a large golden of Costa coloured Indian red. The same beneath. On the thorax are 3 green spots triangularly placed, (a mistaken idea of the shape of the central stripe). The colouring is very dead and unnatural. The costal band of Primary is not very particular to exact form, neither are the original bands of green. However there is little doubt that his fig. represents the typical form of the ♂ Priamus.

♀. Hab. Ceram. In Brit. Museum. Discoidal cell with a small white spot two-thirds from the base; repeated on the under side, rather larger. All the wings are lighter than in the Amboyna specimens. Length of costa 98 mm. An Amboyna specimen has a costal length of 108 mm; and a ♂, locality not given, 86 mm.: a Ceram specimen has the same expanse.

The largest ♀ I have known had a costal length of 112 mm.; or an expanse of $9\frac{1}{4}$ inches for the whole insect.

The ♀ figured in Dr. Fickert's paper contains a small wedge-shaped white spot in the cell of the upper wings, repeated on the under side.

O. CASSANDRA.

- Ornithoptera Cassandra*, Scott, Trans. Ent. Soc. New South Wales, I. p. 131. t. 10 (1866); II. p. 49 (1869).
 " " Scott, p. 517; *Papilio Cassandra*, Butler, in Brenchley's Cruise of the Curaçoa, p. 474. t. 50. (1873).
 " " Kirby, Syn. Cat. Diur. Lepid. p. 517. (1871) Supplement, p. 809. (1877).
O. Cassandra, Dr. Fickert, Ueber die Zeich. der Gatt. Orn. (in Zoologischen Jahrbüchen p. 701. (1888).
 " Mentioned by Sidney Olliff, Austr. Butt. p. 39. (1889).

The females of this species are probably more variable than those of any of the other forms of *Ornithoptera*, or its section *Priamoptera*, especially on the superior wings. The size of the specimens also greatly differs, some being quite as small as those of *O. Richmondia*, and closely assimilating in appearance. Indeed it is almost impossible to divest ourselves of the idea that *Richmondia* is a smaller local Australian form of *Cassandra*. The disparity in size obtains much more between the males of the species, the amount of colour and mark variation being greatest in the ♂ of *Richmondia*, as it is greatest apparently in the ♀ of *Cassandra*. The disposition of the markings on the fore wings of the ♀ of *Cassandra* is generally the same in all the specimens, though differing so much in size and form; a considerable amount of asymmetry also obtains.

The colours of the ♀ are generally very sombre, in some specimens almost black; consequently there is no difficulty in distinguishing them from the females of other species. The nearest approach in depth of tint is in the ♀ of *P. Crasus*, where there is the same tendency towards the diminution of the spots in some examples.

As will be seen above a ♀ was first described by Scott in 1866, and a figure given, in the New South Wales Ent. Society's Transactions. In consequence of the great amount of variation between the individuals of this sex, it was found advisable to re-describe it, in 1869, in a succeeding vol. of the same work, when the ♂ also was fully described. In accordance with my plan, I herewith present these descriptions, first of all.

"♂. $7\frac{1}{2}$ lines largest, $6\frac{7}{8}$ smallest, of 9 specimens.

"Superior wings: Upper surface deep velvety black, relieved by 2 broad irregular curved bands of rich satiny green, which spring from the base; the one runs under the costa towards the anterior angle; the other, along the inner margin and the outer margin, as far as the discoidal nervule: immediately over the latter is placed a large brownish patch, disposed longitudinally. Under surface, black, with a central spot, and a large macular band, formed in contiguous wedge-shaped spots, placed between the nervules, of gilded green. The wedge-shaped spots are distinctly separated into 2 divisions by a broad black band. There are, also, 2 irregular greenish streaks towards the centre angle, the inner one being short, almost macular.

"Inferior wings. Upper surface bright silky green, with the entire marginal border and 4, sometimes, 5 large oval spots, disposed between the costal nervule and the first, or second median nervule, one in each space, velvet black; between these spots and the posterior border are 2, or 3, minute golden green orange specks, which, how-

ever, are not seen in some of the specimens. The tendency to change also exists in the large quadrate golden coloured space at the immediate basal portion of the anterior margin, shown by some, while in others it is much lessened, or nearly obsolete. Long, fine, closely-set dark brown hairs spring from immediately underneath the inner margin, and rising upwards partially envelops the upper portion of the abdomen. The outlines of the nervures are easily traceable by narrow, but distinct lines of black. Under surface corresponds to the upper, but the green is of a more golden hue; the black dots, here 7 in number, become larger and less oval, and the nervures are broadly picked out with black.

"Head and thorax deep black, the latter bearing above a central line of satiny green, and below crimson spots on either side. Abdomen bright golden yellow."

♀. Length $7\frac{3}{4}$ inches expanse. Upper surface of rich black brown, relieved by markings, but in a lesser degree than any of its congeners.

"Primary: With various patches and spots of impure white, principally running obliquely; 3 are placed in the discoidal cell, 1 on the disc immediately under, between the 2nd and 3rd median nervules; another, large and distinct, in each of the spaces between the 3rd, 4th, and 5th subcostal nervures; 2 in each space between the 5th subcostal, and 1st and 2nd discoidal nervules; and a few small and indistinct spots running parallel to the outer margin. Secondaries possess 3 wedge-shaped markings of dusky white, becoming dull ochraceous towards their outer margins, and bearing in their centres large somewhat heart-shaped spots of dark brown which unite in the disc with the median nervules. The sub-quadrate patch of the anal angle, and a small triangular shaped one between the 2nd sub-costal and discoidal nervules, are of a dull ochraceous colour, whereas those situated near the anterior angle and between the 1st and 2nd subcostal nervules are of brighter yellow. The antennæ, head, neck, and thorax are dark black brown, the latter bearing a short central longitudinal band of metallic green, while the pro-thorax on each side is edged with crimson. The abdomen dark black brown, becoming greenish at the top.

"Under surface similarly marked to the upper, but the white is purer, and a bright yellow replaces the ochreous tint: the margins of the large wedge-shaped patches are also here entire. Each side of the thorax is clothed with hairs of a bright carmine, and the abdomen broadly barred with yellow. Port Denison."

[The figure generally agrees closely with one of the specimens in the British Museum.]

"Differs from *Richmondia* ♂ showing on upper surface of anterior wing more distinctly the inner marginal green border, and on the under surface a much smaller green discoidal marking; by the ♀ possessing the tear-shaped marking more occupied by the dark brown spots within them, by the more general sombre appearance, and by the green stripe on the thorax."

I herewith devote a plate each to the ♂ and ♀ of this species. In the pl. of ♂ ♂, fig. 3 represents a variety singularly resembling a specimen of *O. Richmondia* in the shape of the subcostal band, and in the appearance of both surfaces of the hind wings, even to the presence of the golden yellow spots, in each 3 in number on the upper portions; fig. 7 represents the subcostal band of the specimen of *Richmondia*, referred to, which is in the collection of Dr. F. Walker. The greens of this *Cassandra* are all very warm olive, or golden emerald, brightest on the Secondaries. The latter are a rich blue green against the light. The under surfaces are a light green lemon and golden yellow. The black of the upper surface is jet black; of under surface very dark brown; a silky greenish obliquely, and opposite the light. Thorax equally black, with a golden green central longitudinal stripe or ray. The fringe of the abdominal fold dark umber; a green undulated band on the posterior margin extends to the subcostal band; and is broad. Secondaries with 4 rather small black spots with golden spots between 3 of them and the marginal black border, and an extra one inside the costal nervure. The corresponding golden spot on under surface, fills up nearly the whole of the space from the base to the first large black oval oblong spot. (Consequently differing from that in fig. 6 which is very small, and from fig. 2 where the whole space nearly is filled with black, containing a small golden green spot, longitudinal, pyriform, from the precostal nervure, followed by green atoms sprinkled over the black.) Sides of thorax with less red than in other specimens. The Prismatic relation-ship is with *P. Cræsus*. The length of the costa 74 mm., of abdomen and antennæ 28 mm.

♂. The sexual patch of Primary wing in this specimen is of a warm brown velvet. The costal green band is of the normal *Priamus* form, and the green irregular band extends from the base of the inner, to 2-3rds of posterior, margins; the subcostal to the discocellular nervures are broadly black. Of the black spots on Secondaries only 3 are visible, the 2nd and 3rd being smallest. Under surfaces very dark brown. A very small irregular-shaped spot in the cell of Primary wing, green blue; green spots and markings ranging from blue green to golden green. The hind wing has a very greenish golden inner border with still more golden centres between the nervules. One small gold spot in green of costal and subcostal nervures, as mentioned above. Eyes dark brown. Red of thorax not extending down by the legs as in some species. Eyes margined with white beneath. Articulations of antennæ 48. Prismatic reflections of *Cræsus* and *Urvilliana*.

Length of costa 78, width of upper wing 45 mm.: of hind wing, length 48, width 48 mm.; of antennæ 32; thorax and head 11; width of thorax 11; of abdomen 10; and length of thoracic stripe 8 mm.

Length of { 1st pair: femur 12, tibia 19, tarsi 19 mm.
Legs { 2nd " " 11, " 12, " 15 "
 { 3rd " " 11, " 13, " 15 "
(See figs. 5 and 6 in plate 2a).

♂. Secondaries with 4 large sub-oval spots of black, the lowest cuneiform or wedge-shaped. Space above and below the costal nervure black; the nervures black, with black atoms much sprinkled on each side, and on green from the base of the wing. On under surfaces of wing, all the black spots are very large, and unite with the black bordering the nervures and nervules, which at the former is very broad. The green irregular-shaped spot of discoidal cell in upper wings slightly larger than in fig. 6; and the longitudinal small stripe or mark generally found between the 4th and 5th subcostal nervules is quite absent. Length of the costa 75 mm. (See figs. 1, 2.) The green patch in discoidal cell of fig. 4 will be seen to be much larger than in any other, and almost rectangular: while a few green atoms are sprinkled at the base of the cell. All the examples figured in this plate are from the collection of Mr. Oliver Janson; but the real localities I am unable to give at present. The figs. 1a, 3a, and 5a, represent the varying form of the ♂ sericeous patch.

The figures given below exactly represent a variety in the author's museum, viz., 7 ♂, lower surface of secondary; 7a, upper surface of same wing; 7b, upper surface of Primary wing; and 7c, form of sericeous patch. Locality N. S. Wales.



Figs. 8, and 8a, also represent slightly modified forms of costal band and ♂ ser. patch of another example in the same collection.



♂. Secondaries with 4 black spots on upper side, the 1st large and confluent with the black of the costa. Abdomen orange yellow, with lateral cloudy spots, besides subdorsal dots. Resembles a large *Richmondia*. The green marginal band of the Primary wings of this and another example from the same locality much indented or scalloped; in the latter the hind-wing spots are 5, the 5th, or costal being covered by the upper wing. Hab. Queensland. In Brit. Museum.

♂. With only 3 black spots on hind wings, the 3rd very small. The body less orange yellow. Under sides of wings like a large *Richmondia*; opposite the light very yellow green; against the light dark blue green. A very distinct variety. Length of costa 77 mm. Hab. Cape York. In Brit. Museum.

♀. On the Plate 2b devoted to the ♀♀ of this species, figs. 1, 2, represent a fairly abnormal example from the Coll. in Mr. F. Horniman's Museum. Hab. unknown. The colour of the wings is much warmer than in some specimens, both in the browns and yellows: while the white marks are much darker than usual on the upper sides of the Primaries. The abdomen appears to be unclouded, dorsally and laterally. The shape of the white mark in the upper discoidal cell, is large, continuous, and approaches more the outline of that in a ♀ *Aruana*, or of a *Pronomus*. Length of costa 94; width of front wing 54 mm.; length of hind wing 67, width 45 mm.; length of abdomen or antennæ 35 mm.; of thorax with head 22 mm.; width of thorax 12 mm.

Length of legs { 1st pair: femur 13, tibia 9, tarsi 13 mm.
2nd " " 13, " 14, " 16 "
3rd " " 12, " 12, " 18 "

In figs. 3 and 4, the sordid appearance of the white marks on the upper surface of the Primaries is produced by a multitude of dark atoms scattered on the grey, and graduated from the outer margin till they are lost. On the under sides these atoms are not present, and the marks are nearly pure white. On the Secondaries the acuminate marks are a dull speckled ochre below the enclosed black spots, and white speckled with dark atoms above; the under surfaces are purer white, and a rich yellow, without atoms. The Primaries are slightly shot with green, and the whole ground work of the wings is of the darkest black brown. The white discoidal mark is, one half above partly divided, lower part again divided entirely into 2 small longitudinal nearly parallel spots. A difference may be also observed between the marks of the superior wings of figs. 3 and 1. Those on the upper surfaces of the wings of the former being so much the longest and most perfect. The thorax is very villose, with the central ray golden green, instead greenish golden as in fig. 1. The red on sides of breast reaches half-way to the upper part of the pronotum; the eyes margined with white; abdomen sordid white with rufous suffusion towards the anal valves, which are a darker, or brownish rufous; dorsal pale smoky brown stripe; subdorsal warm lemon yellow; and the subdorsal segments strongly accentuated with black. Thorax warm brown, legs black; eyes very dark brown. Length of costa same as in fig. 1.

In the author's museum. Hab. N. S. Wales.

♀. Upper sides of all the wings very black brown with faint reflections of brown olive mostly on the Primaries. The patch in the disc. cell like that in fig. 1; remaining marks nearly in shape and relative size like those in fig. 3. The yellow of the under wing near the costa very rich; the spots enclosed by white on the under wings larger in proportion than those in either of the figs. of my plate; abdomen very smoky brown except the last 2 segments, where the sides are suffused with yellow scales. The under side only differs in colour intensity, which is greater in the yellow, and slightly less in the black. Length of costa 83, width of upper wing 44, length of hind wing 54, width 37 mm.; of antennæ 30 mm.

Hab. Cammerunga, Queensland. In the Coll. of Capt. Bourke, R.N.

A ♀ in the British Museum from Cape York, has very dark Primaries. There is also in the same collection a large dark variety from Lizard Island, sparsely marked, especially on the upper wings, which appears to be a local form intermediate between *Cassandra* and *Richmondia*, with a likeness to the ♀ of *P. Cræsus*, which we must deal with later on.

I give, for comparison of the shapes assumed by the upper discocellular spots the following figs.:—Fig. 1. In the collection of a friend, Hab. Queensland. Fig. 4. Represents the subdorsal part of the abdomen of this ♀.



Fig. 2. In the author's museum. Hab. Queensland. The spot here is continuous, and large. Fig. 3, locality unknown. In Coll. of a friend, whose name I am not at liberty to quote.



Figs. 5 and 5a, in author's collection. Hab. unknown.



Figs. 6 and 6a, also in the author's collection. Hab. Queensland. It will be therefore seen that we here have a very representative series by which to enable us to recognise the species.

It may be added that the depth and extent of the black cloudings on the abdomen of different examples varies greatly, as does the character of the yellow, or from a rich lemon to orange.

Mr. Butler, in "The Cruise of the Curaçoa among the S. Sea Islands," p. 474, describes and figures a ♂, giving an indication in chromolithography of the brilliant play of golden orange reflection on the green; but the printer has exaggerated them, and they are not sufficiently natural. The sericeous patch is too prominent also. The locality of the specimen was Queensland. It is now in the Coll. of the Brit. Museum.

Localities of specimens examined by Dr. Fickert were Port Denison, Bowen, and Herbert River, Middle Australia.



NOTE.—Additional Bibliographical References to the foregoing species *O. PRIAMUS* and *O. CASSANDRA*.

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 Seba, Thes. IV., p. 54, t. 44, f. 22, 23, (♀) (1765).
 ♂ *Papilio Eques Priamus*, Linn., Amoen. Acad. V., t. 3, f. 203, (1758).
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 ♂ " " " " Goetze, Ent. Beytr. III., I., p. 28, n. 1, (1779).
 ♂ " " " " Blumenb., Handb. p. 356, n. 1, (1782).
 ♀ " " " panthous, Linn., Syst., Nat., ed. x., p. 461, n. 16, (1758).
 ♀ " " " " Clerck, Icones Ins. II., t. 19, (1764).
 ♀ " " " " Linn., Mus. Lud. Ulr., p. 195, n. 14 (1764).
 ♀ " " " " Houttuyn, Naturl. Hist. I., 11, p. 199, n. 16, (1767).
 ♀ " " " " Linnæus, Syst. Nat. ed. xii., p. 748, n. 17, (1767).
 ♀ " " " " Müller, Natur. V. 1, p. 571, n. 17, (1774).
 ♀ " " " " Fabricius, Syst. Ent. p. 448, n. 25, (1775).
 ♀ " " " " Cramer, Pap. Exot. II., p. 39, t. 123, f. A.; t. 124, f. A. (1777).
 ♀ " " " " Goetze, Ent. Beytr. III. 1, p. 37, n. 17, (1779).
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 ♀ " " " " Jablonsky, Natur. Schmett. I., p. 207, n. 8, t. 5, f. 1, 2, (1783).
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 ♂ *Papilio Priamus*, Donovan, Ins. of India, t. 16, (1800).
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 ♀ *Papilio panthous*, Godart, Enc. Méth. IX. p. 25, n. 2, (1819).
 ♂ ♀ *Papilio Priamus*, Thon, Ent. Arch. p. 124 (1828). Ibid, Naturg. Schmett., p. 16, t. 1, f. 1; t. 2, f. 3; t. 3, f. 2, 3 (♂, ♀) (1837).
 ♂ ♀ " " Gray, Cat. Lep. Ins. Brit. Mus. I., p. 1, n. 1, (1852); Ibid, List. Lep. Inst. Brit. Mus. I., p. 2, n. 1, (1856).
 ♂ ♀ *Ornithoptera Priamus*, Doubleday, Westwood, and Hewitson, Gen. Diurn. Lep. I., p. 4, n. 1, (1846).
 ♂ ♀ " " Vollenhoven, Tijdschr. v. Ent. III., p. 70, n. 1, (1860).
 ♂ ♀ " " Koch, Indo-Austr. Lep.-Fauna, p. 35, (1865).
 ♂ ♀ " " Butler, Cat. Diurn. Lepid., descr. by Fabricius, p. 234, n. 1, (1869).
 ♂ ♀ " " Kirsch, Mitth. Mus. Dresden, I., p. 110, sub. n. 1, (1877).
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 ♂ ♀ " " Pagenstecher, Jahrb. Nassau. Ver. Nat., p. 201, (1884).
 ♂ ♀ " " Honrath, Berl. Ent. Zeit., Sitz.-Ber., p. 11, (1886).
 ♂ ♀ " " Ribbe, Iris II., p. 207, n. 1, (1890).
 ♂ ♀ " " Kirby, Nature, Vol. 51, p. 244, 245, 1895).
 ♂ ♀ *Troides Priamus*, Rothschild, Novitates Zoologicæ, V. II., p. 183; also (types ♂ ♀), p. 185, (1895).

Habitats: Amboina, (Southern Moluccas), Ceram, (Ceylon, India: local errors).

[The number of black suborbicular spots on the upper surface of the posterior wings of the ♂ varies from 2 to 6 in a series of 14 examples in the Museum of the Hon. W. Rothschild; and the length of the costa of the primaries from 70 to 95 mms. See "Nov. Zool.," Vol. II., pp. 185-6.] The colour of the ♀ also varies from a light brown, to a very dark, almost black-brown.

2. *O. CASSANDRA*.

♂ ♀ *Ornithoptera Priamus*, v. *Cassandra*, Semper, Journ. Mus. Godeffroy, Heft. 14, p. 41, sub n. 128, (1878).

Mr. Rothschild, "Nov. Zool.," Vol. II., p. 186, places *O. Cassandra* ♂ ♀ as a synonym of *O. Euphorion* (Gray). It will be seen in another part of this work that I have to regard *O. Euphorion* as a var. of *O. Pronomus* Gray).

Habitats: Queensland, Rockhampton; examples are also in my collection, and that of Captain E. Bourke, late R.N., taken by him on Thursday Island. The species appears to be fairly common in that locality.

Corrections of typographical errors or omissions on p. 4 of this Vol. :—

- Pap. Priamus*, Linn., Syst. Nat. ed. x., p. 458, n. 9, (1758).
 " " " Mus. Ulr., p. 182, n. 1, (1764).
 " " Cramer, Pap. Ex. I., p. 35, t. 23, f. a. n. (1775).
 " " Godt. Enc. Méth. IX., p. 25, n. 1, t. 2, f. 4, (1819).

ORNITHOPTERA RICHMONDIA.

Papilio Richmondia, Gray, Cat. Lep. Ins. B.M.I., p. 2 n. 2. f. 1, 2. (1852)

Ornithoptera Richmondia, Standinger, Exotische Schmetterlinge, Taf. E.

O. Priamus, L., var. *Richmondia*, Dr. C. Fickert, Ueber die Zeichnungsverhältnisse der Gat. Orn., p. 702 (1889):

Pap. Priamus, var. *P. Richmondia*, W. F. Kirby, Syn. Cat. of Diurn. Lepid., p. 517. (1871).

THIS is the smallest of the Ornithoptera at present known to science; and though in many respects it bears a resemblance to *O. Priamus* and one or two others of that genus, it would scarcely be mistaken for either of them, at least as regards the ♂. In size alone it differs very materially, the largest example being somewhat inferior to the smallest example of *Priamus*. The ♀ would have a better chance of being mistaken for the type species. The ♂ is especially variable on both surfaces, whether in colour or markings, it being almost impossible to find two examples in a long series which are very closely alike; a considerable difference in size also obtains. The variation in the ♂ appears to be restrained within more strict limits.

In the plate is a series of figures illustrative of the range of variation, which though not by any means exhaustive, will convey a very fair idea of this interesting fact. Before, however, more fully referring to them, it will be best to quote Gray's description of the two sexes almost *in extenso*.

"♂ Primaries similar to those of *Priamus* in colour and markings, except that the irregular green band extending from the base along the inner margin, and continued up the outer margin towards the anterior angle, only reaches a little beyond the 1st median nervule. In all the other species it reaches the 5th subcostal nervule."

[In a specimen in my collection (see fig. 3b in the Plate) this band really extends up the wing till it almost forms a junction with the apical end of the costal green band].

"Secondaries similar; but the round black spots are 4 or 5 in number, commencing in the space between the costal nervule and the first subcostal nervule, the 1st and 2nd being without the small golden spot which is found in *Priamus*."

[A reference to the plate will show that this latter distinction does not always hold good, though it may be accepted as the rule; for while these golden spots are absent also from the corresponding positions in figs. 1a, 3b, d^{ll}, e, and g^l, they are to be found well indicated in c, where every black spot has its golden companion and in f where the 1st, 3rd, and 4th spots are similarly attended.]

"Underside of primaries like that of *Priamus* in form of markings, but with a bluish tinge, and the spots between the nervules more distinctly separated into two parts in each space by a broader band of black that runs from the 5th subcostal to the 1st discoidal nervules. Underside of secondaries like that of *Priamus* in general appearance, but the greater part of the surface is of bluish green—" [As also in *O. Pronomus* and *O. Cassandra*; but in fig. c^l of plate will be found a variety with the green like that of the underside of the corresponding wing of *O. Arruana*] "the base,

and around the nervure inwardly of the discoidal cell, black; the spot between the costal and 1st subcostal nervule is of an irregular form, and of a king's yellow; this colour extends around the outer margin between the black spots and the margin; the space between the 3rd median nervule and the submedian nervule is mostly bluish green, but posteriorly yellow, with the base and a spot near the outer margin black; the inner margin brown."

"♀ Primaries similar in markings to those of ♀ *Priamus*, but less in size, and covered by numerous minute black scales, which give them an obscure appearance." [These scales are equally or even more strongly scattered over the white and ochraceous markings of *O. Cassandra*, less so in *P. Urvilliani*, and still less, or only in those of the hind wings of *O. Arruana*.] "—Secondaries similar, except that the large spots, which are of the same tear-shaped form, between the nervules along the outer margin touch the nervules on each side; and the 4 between the 2nd subcostal and the 3rd median nervules are similar to one another in having a black sublunate spot in the middle of each, which is sometimes connected with the outer margin. The two spaces between the costal nervule and the 2nd costal nervule are marked with 2 irregular spots each, the one nearest the margin being ochraceous. The anal angle has a subquadrate spot of ochre colour.—" [Although GRAY makes no mention of the ochraceous colour of the outer portions of these "tear-shaped" spots, probably they are obscurely visible in his specimen. In the 3 examples before me this colour is distinct enough, especially in the one figured (5 ♀), also in *O. Cassandra* ♀. As these acuminate grey marks are less densely clothed with scales than the other parts of the wings, especially on the upper side, probably this ochraceous appearance is the result of the yellow of the under surface appearing through; it certainly is so in some specimens of this species and of *Cassandra*; but in others it is caused by the yellow scales on the upper surface, mingled with and subdued by the larger black scales, which produces the grey appearance of the markings, or more properly the divided band.]

"— The under surface of all the wings similar in markings to the upper side, but the white colour is not so obscured by minute black specks; each large tear-shaped spot in the secondary wings with the outer portion yellow. The spot between the 1st and 2nd subcostal nervules and the one at the anal angle partake more of the tear shape than those of the upper side, and it contains a brown spot, somewhat like the other in form."

♂. "The spots on the sides of the discoidal cell, on the under surface of primaries are like those of *Cassandra*. Head, breast and legs like those of *Priamus*. The abdomen yellow, and the sides black. ♀. "Head, breast and legs like those of *Priamus*." FICKERT.

To these descriptions may be added:—

♂. The abdomen is of the most vivid lemon yellow, with a slightly orange dorsal centre extending to the beginning of the anal segment, which has a triangulate band of deep softened black, broadest in the middle, as in most of the ♂♂ of the genus *Orniioptera*; the sides of the abdomen are are clouded with black more or less dense; in some specimens this clouding is interrupted by the articulations of yellow, while the subdorsal articulations are well defined in black. The thorax has the green central longitudinal stripe peculiar to this genus, all other parts as well as the head being entirely velvety black; the eyes are reddish-brown.

There are two well-defined types of colour and under-surface markings in the ♂♂ of this species. One is deep bluish-green, the other a warmer green, more like that of the ♂ *Arruana*. In one type there is always a suboval black spot, sometimes small, or little more than a few black scales, in other examples large, situated between the submedian nervure and the 3rd median nervule which is very much independent of the black atoms which extend from the inner side of the submedian nervure; in the other type it coalesces with them so as to form a black patch which fills up the greater part of the space to the yellow band; [see figures] in such cases the base is broadly black also. The costal yellow spot or patch on the under side varies in size, and is often followed by a second after the black spot, which seems sometimes to separate what would otherwise be a continuous yellow mark. The same then obtains on the upper side, but the black spot is absent, its place being taken by the general green of the wing which naturally nearly divides the yellow. Viewed against the light in a certain position the upper side of this species has the colour reflections like the ground colours of *P. Cræsus*—the costal band of green looking exactly like the latter when viewed in the same position, the reflections on the under wings being rather more coppery, or like those of *O. Priamus*, and the hastate green markings of *T. Brookeana*. The costal green band is long and rather plumose-shaped, and varies in form and colour in almost every specimen. In the plate are given 7 examples of variation, all from my own collection. In one specimen in the Museum of Dr. F. Walker the apical end is 6 mm. broad from the 4th and 5th subcostal nervules, about 7 mm. of the length being divided by nearly 3 mm. breadth of black. The green normally reaches to within 3 mm. of the anterior angle; but one example in Mr. H. Grose-Smith's museum runs nearly to the fringe. In a specimen of the Hewitson collection the outline copies very closely that of *Priamus*. In the plate will be found sketches of the male (or sericeous) patch (*a'*, *b'*, *d'''*) to show variation. The specimen from Dr. Walker's collection, quoted above, has a *much* larger and more prominent patch, differing also from these in outline; the Hewitson example is very prominent in colour also. On a wing denuded by the Waterhouse process this sericeous patch does not show so much as in other species, but very little importance can be attached to this fact without examining a good series of the same species so prepared. In some specimens the spots of the wings are assymetrical, though not to the same extent as in

Ætheoptera Victoria ♀; the costal green band or stripe is also occasionally assymetrical for the two wings. I have given a diagram of a curiously waved neuration in a specimen in my own collection, where all the veins of the forewing are waved or bent just as the 3 median nervules always are in this genus. The length of the costa in the largest British Museum example is 60 mm.—the exact size of my largest; width of upper wing 40 mm.; length of hind wing 35, and width 27 mm. Length of antenna and of abdomen 24, and of thorax with head 17 mm.

Length of legs (1st pair—femur 9; tibia 7; tarsi 10 mm.

2nd " " 9; " 9; " 11 mm.

3rd " " 2; " 9; " 11 mm.

Length of costa of smallest specimen in British Museum 53, and of my smallest 51 mm.

♀. The variations in the markings and colours are not nearly so great as in the ♂. The white markings within the discoidal cell, however, change in form and extent in different examples, sometimes being like that in figure 6b of the plate; occasionally divided into two or three spots; sometimes the two lower divisions of the spot are obsolete, the upper division only remaining, and being very

small. The size, position, and forms of the markings are generally repeated faithfully on the under side, with an occasional assymetry. The abdomen is greenish-black above (the black being composed of a multitude of scattered atoms, the central dorsal portions being sometimes of a dark brown; the latter portions yellowish, with heavy black spots in some examples, and smaller dots or spots close to the articulations; the extreme subdorsal is yellow, the articulations well defined in black. The thorax is black; the collar red and divided; eyes red brown; the red breast spots are found on the meta-, meso-, and prothorax, the mesothoracic spot being much the largest.

Length of costa in the largest British Museum specimen 77; of my smallest 66 mm. Length of costa of fig. 5 in the plate 70, width of wing 37 mm.; length of hind wing 50, width 31 mm.; length of abdomen 29 mm (I regret that I have inadvertently drawn the antennæ 5 or 6 mm. too short); length of thorax and head 22 mm.

Length of legs (1st pair—femora 9; tibia 7; tarsi 10 mm.

2nd " " 9; " 10; " 11 mm.

3rd " " 9; " 10; " 11 mm.

The ♂♂ of this species are suggestive of its being a local variety of *O. Cassandra*; but the ♀♀ leave quite a different impression, as will be shown in the descriptions and iconography of that form; but the two sexes almost compel us to regard it as merely a small-sized local race of *Priamus*.

The types of this species are in the British Museum.

The figures of the Plate are all drawn from specimens in the author's museum.

ORNITHOPTERA PEGASUS.

Ornithoptera Pegasus, Felder, Reise Novara, Lep. I. p. 6. n. 4. t. 2. a, b, (1865).

O. Priamus, var. *Pegasus*, Dr. C. Fickert, Zool. Jahrbüchern, p. 707.

" var. *K. Pegasus*, Kirby, Syn. Cat. Diur. Lepid. p. 518. (1871).

O. Pegasus, (vars.) Th. Kirsch, Beitrag zur Kenntniss der Lepidopteren-Fauna von Neu-Guinea, in: "Mittheilungen aus dem K. Zoologischen Museum zu Dresden." Zweites Heft, Taf. V. fig. 1 ♀; fig. 2, ♀. (Dresden 1877.) text, pp. 108, 109.

O. Pegasus, (on Kirsch's vars.) Oberthür, Études d'Entomologie (Cat. Raisonné de Pap. de la Coll. de Ch. Oberthür) pp. 27, 28.

O. Pegasus, Staudinger, Exotische Schmetterlinge text., p. 3. No figure. (1888.)

♂. Costa of the superior wings arched. Upper side velvety black, but with a considerable admixture of reddish brown, especially towards the posterior margin. The subcostal band commences, as usual, near the base of the wing, where it is divided by the subcostal nervule and extends to within 4 mms. of the apex. Its greatest width is 7 mms. at a point nearly close to the 1st discocellular nervule, but within the cell; its least width is 2 mms. near the base, and near the apex, where it insensibly diminishes to a point; within this area are included the greater part of the costal and subcostal nervules, the 1st and 2nd subcostal nervules, and a brief portion of the 3rd, also 1-3rd of the 1st discocellular nervule; its greatest width within the discoidal cell is about 2-7ths, and its least not more than 1 mm.; this band (ribbon, Felder terms it) is graduated in its curve through the whole length from base to angle of its lower side except on each side of the discocellular nervule, where it becomes slightly broader, or encroaches a little on the area of the black; the greatest breadth of black above this band is at a point 3-4th of the length of the costa from the apex, where it is 4 mms. wide, the subcostal nervules being distinctly visible in the black; the 4th subcostal nervule runs broadly through the green from the direction of the anterior angle; the white band is of a rich vegetable green and is softened along its outline by green atoms encroaching slightly on the black; a thin ray of black atoms is seen along the green above the 4th subcostal nervule; a band of the same green commences at the base of the interior margin, extends nearly to the anterior angle, and without interruption continues up the posterior margin of the wing till it reaches the 5th subcostal nervule and is only represented by a small green spot. This band is more or less broad—broadest between the 3rd median nervule and the submedian nervule—and is distinctly divided into green spots by the wing folds between the 1st median and 1st submedian nervules; the outer edges of this band up the posterior margin are slightly indented by green atoms on the narrow black margin: the inner edges are also softened by the green atoms; the internal nervule appears well accentuated in the green; the median and submedian nervules are strongly dusted with green atoms, chiefly from a short distance from the base on the median nervule to where its first branch commences, the 3 median nervules being dusted in the same manner to within a millimetre of the sexual brand, nearly as in *Aruana*, *Pro-nomus*, and *Eumæus*: the sericeous patch, or sexual brand is more than usually pupæform, and of a light velvety reddish brown. The whole of the green on the upper wings is shot with more or less brilliant coppery or salmon coloured reflections; viewed obliquely against the light the velvety black also partakes of the same, thereby giving it quite a ferruginous appearance.

The Secondaries are a rich vegetable green, with a

cupreous tint when viewed obliquely against the light. The green when seen in the normal attitude is quite of a mossy tone—viewed opposite the light it is very silky and somewhat golden. The irregular ferruginous cloudings found on the type are, no doubt, caused originally by damp. The apex and outer margin are narrowly black, and part of the costa from the base within the subcostal nervule to the commencement of its 1st branch is black, including the interno-median nervule; the abdominal margin outside the submedian nervule is velvety black; a small black spot is situated between the 1st and 2nd subcostal nervules, and the 2nd subcostal and discoidal nervules; the whole of the green of the cell and to some distance without is dusted and darkened with black atoms. Underside of Primaries vegetable green, with cupreous reflections, strongly diluted outside the cell by ferruginous dark atoms, except in a portion within the 2nd median branch and the submedian vein, which is more of a green verditer; the space within the cell is divided almost equally into green and black—the narrowest portion of the green at the base, the broadest at rear the discocellular nervules, giving it somewhat of a claviform appearance; all the nervules and their branches are separated from the green by narrow black margins on each side; the costa is black; between the 3rd and 4th, and 4th and 5th subcostal nervules most of the space is black, with patches of green atoms, terminating in long narrow rays of green scarcely visible atoms nearly to the hind margin; 5 discal black spots occur in the space within the 1st discoidal nervule and the submedian nervule, these are somewhat lunulate, they are all fairly small, and vary slightly in size and shape; the posterior and inner margin are black; the submedian *pseudoneurus* is prominently black half its entire length. Underside of Secondaries vegetable green, with cupreous or salmon coloured reflections, and diluted without the cell by ferruginous atoms; all the veins are strongly accentuated, the median vein being a golden yellow from the base; a patch of golden yellow between the 3rd median nervule and the submedian nervule, extending from the anal angle half way towards the base; 6 discal black orbicular spots within the veins midway between the cell and the margin, of a medium size, the first 3 from above being the largest (a minute yellow spot outside the lowest of these), the lower 3 the smallest; the posterior and anterior margins and the base, including the precostal nervule, black; the abdominal margin glossy fulvescent; the abdominal fringe with long hairs of a rich burnt sienna colour.

Head black; eyes deep castaneous brown, margined with ochreous white; haustellum shiny black. Thorax velvety black, with a central longitudinal green mark above; beneath black with the usual lateral crimson or coccineous spots.

Abdomen brown ochreous yellow, with the usual black trigonal mark; and the lateral black dots very obscure.

Length of antennæ 34 mms.; number of articulations 48; length of Thorax with the head 21 mms., width 11 mms.; length of Abdomen about 34 mms.

Length of Legs: (1st pair, femur 13; tibia 10; tarsi 15 mms.
2nd " " 15; " 15; " 19 "
3rd " " 12; " 15; " 19 "

Expanse of Costa 81 mms.; width of upper wing 43 mms.; length of lower wing 45 mms.; width 39 mms.

♀. Primaries: costa moderately arched; external margin slightly concave; interior margin nearly straight. Upper surface of wing obscure fuscus brown; fringe lunules ochreous-whitish, and very slightly expressed; all the marks and spots greyish-white, dusted with dark grey atoms; within the discoidal cell a large oblique, irregular, tetragonal patch more or less excised on its outer and inner edges; 8 discal longitudinal white marks between the veins—the first, within the 3rd and 4th subcostal branches, short; the second, between the 4th and 5th subcostal branches, short; the third, between the 5th subcostal and 1st discoidal branches, twice as long: all of them hastate; the fourth very small, cuneiform, and midway between the cell and hind margin; separated from this, and towards the hind margin is a larger subcuneate spot: between the 5th subcostal and 1st discoidal nervules a minute nearly obsolete white spot, almost close to the median nervure, and a submarginal suborbicular small spot: between the 1st and 2nd discoidal branches a long tetragonal mark, its outer end more or less deeply excavated to about half its length, with a suborbicular white submarginal spot: between the 2nd and 3rd median branches a longitudinal nearly equilateral mark, with curved apex and deeply sinuate base, and a small submarginal rhomboidal spot: between the 3rd median nervule and the submedian *pseudoneurus* a somewhat shorter hastate mark, and a minute submarginal white dot, with an oblique, larger, twin spot outside the *pseudoneurus*. Under surface of Primaries with wing colour a rich light fuscus brown; the white spots the same in number and position as above (slightly ochraceous grey, without atoms), and nearly the same in size and shape, except that between the 1st and 2nd median branches there are three spots instead of two—the one nearest to the cell being rather large and irregular in shape, a cuneiform mark midway between it, and a small submarginal rhomboidal spot, and that the mark between the 2nd and 3rd median branches is not excavated as above; the longitudinal hastate mark between the 5th subcostal and 1st discoidal nervules a brown irregular-shaped spot, differing from that on the opposite wing.

Secondaries: upperside obscure fuscus brown (posterior margin moderately scalloped; abdominal margin nearly straight; costa considerably curved, especially towards the apex; fringe lunules well defined, and fuscus-yellow); a subcostal spot not far from the apex fuscus-yellow; the 2nd subapical mark within the subcostal branch irregular in form within and without, and more or less excavated, of a sordid ochraceous white, with dense fuscus atoms; the remaining large area of wing outside the cell, from the 2nd subcostal nervule to the submedian vein is a sordid ochraceous white, with graduated fuscus atoms, becoming denser towards the hind margin, till they are

nearly confluent; strongly sinuate or dentate below between the 1st and 2nd subcostal nervules the whitish area only extends to within 5 mms. of the cell, and the curved outline narrows to the apex of the mark, which is rounded off; the area between the 2nd and 3rd branches is also separated from the median nervure by an oblique area of brown 6 mms. in depth; that between the 3rd median branch and the submedian nervure begins about half way from the base of the wing, and below its enclosed spot is clouded with brown striae and atoms, with whitish atoms a little way above and on the enclosed brown spot; this large whitish area also encloses five obtuse oblong brown spots, sinuate at their base; the marginal border rather broad, and of the same fuscus brown as the other parts of the wing; the interior margin of the upper wing with a rather dense fringe of fuscus hairs, and the greater portion of the brown area from the base within the cell, towards and in the abdominal margin, is also clothed with similar and longer hairs.

The under surface of the secondary wings with all the markings corresponding with those above, with the addition of a congeries of yellow atoms, and a moderately large cuneiform mark of the same colour within the subcostal nervure, and a small congeries of whitish atoms just within the lower part of the cell; the brown of the wing is a redder and richer fuscus; the whitish areas are a graduated pure reddish ochreous, and without the fuscus atoms of the upper side. The *pseudoneura* of the Primary wing moderately visible.

Head dark fuscus brown; eyes deep castaneous brown, margined with ochreous white, as in the ♂; haustellum piceous black; antennæ black.

Thorax fuscus brown, and very hairy, with a central longitudinal green mark; beneath brown, with large crimson scarlet breast-spots.

Abdomen: dorsal, greyish ochreous white, most grey on the first 3 segments; subdorsal, deep reddish ochreous, with lateral black dots, and the segments well expressed by black; anal segment very brown fuscus; and tuft light brown.

Expanse of costa 93 mms.; width of wing 54 mms.; length of secondary wing 61, and width 44 mms.; length of antennæ or abdomen 41 mms.; number of articulations of antennæ about 58; length of thorax with head 22, and width 10 mms. The legs of the type are in too imperfect a condition to be measured.

Hab. New Guinea, Western Coast [Exp. Ätna], Northern Coast; Dorey (Wallace).

Figs. 1, 2, ♂ and 4, 5 ♀ in my plate fully represent Felder's types, which I have re-drawn and re-described, with the earnest hope that this addition to the valuable labours of the Felders may prove useful to the students of this beautiful species.

Fig. 3 ♂, represents a var. in the collection of Messrs. Godman and Salvin. The differences in colour and general appearance from the types are not important. The upper surface presented nothing worthy of particular notice, but a comparison of the under surface with the type will reveal some interesting variations in the marking. I am indebted to the owners for the privilege of making

the sketch from their specimen, and satisfying myself, at any rate till we obtain more examples, of the distinctly specific value of this form.

The nearest affinity of this species is with *O. Aruana*, the underside markings of which in the ♂ singularly resemble some examples of that species; but both in the ♂ and ♀, the form is certainly more robust, and not quite as graceful in outline; while the colour of the green is absolutely unlike the green of any other species, being a deep mossy or vegetable green. The dark parts of the insect also, as well as the greens on the under surface are remarkable for their curiously strong ferruginous appearance—a characteristic which may be observed in probably all the examples with which we are at present acquainted. I have satisfied myself that this is not the result of damp, as at first I had supposed. The ♀ also greatly differs, especially in colour, from examples of *Aruana*.

I am indebted to the kindness of the Hon. Walter Rothschild for the privilege of making the Felder types of this species the subjects of my figs. and re-descriptions.

Felder, in *Wien. Ent. Mon. III.*, p. 264, n. 12. (1859), and *Lepidopterologische Fragmente*, p. 9 (1859), describes a variety under the name of *O. Archideus*, which must evidently be included with *Pegasus*. The following is his diagnosis:—

“♂. *Alæ sericeo-virides cupreo plus minusve micantes, anguste nigro-marginatæ, anticæ supra costâ fasciæque latæ; discali, longitudinali nigris, hac postice spatium velutino-brunneum includente, venis medianis virescentibus subtus nigræ, spatio cellulari, maculisque octo elongatis, exterioribus, virescentibus, inferioribus, quinque macular nigras includentibus.*

“*Alæ posticæ sæpius supra maculis binis exterioribus, nigris, subtus margine interno flava vel cupreo tincto, sæpius omnino cupreo suffusæ, maculis, exterioribus sex nigris.*

“*Thorax niger, supra medio virescens, subtus adlaterâ rufo villosus. Abdomen stringue flavum, punctus quinque lateralis nigris.*”

♂. Wings silky green, with more or less of coppery reflections; the margins are all narrowly black; the primary wing has a broad subcostal band on the upper surface; the cell is long, and the greater portion black, the dark area exterior to the cell appears as if suffused with brown (the sexual brand is a warm velvety brown); the median nervure and its branches sprinkled with green; the under surface of the wing is black, including part of the discocellular area (as above)—the lower part lon-

gitudinally green; outside the cell the disc is divided by the veins into 8 elongated green spaces (of which the two uppermost are the shortest), including 5 inferior black spots. [In the type, *vide ante*, there are 6.] Hind wings on the upper surface sometimes with a couple of black spots outside the cell; the under surface of the wing with the interior margin yellow, tinged with copper colour, and sometimes entirely suffused with the same colour; the discal or outer marginal spots are six in number and are black.

Thorax black, with a green longitudinal central mark, the sides beneath are red and hairy; abdomen, on either side yellow, with 5 lateral black dots.

No Habitat is indicated by Felder. The original of this description is in Mr. Rothschild's collection.

As may be observed in the bibliography at the head of this article, Herr Kirsch describes two remarkable forms, which he considers to be varieties of this species from New Guinea. The first of these, see “*Mittheilungen aus dem Kenntniss Zoologischen Mus. zu Dresden, von Dr. A. B. Meyer (Beitrag zu Kenntniss der Lepidopteren fauna von New Guinea, von Th. Kirsch.)*” Taf. V. fig. 1; is a ♀ from Rubi und Waweji. The discocellular mark is golden yellow, edged with an emerald green tinge, all the other marks on the fore wings are white; on the hind wings the discal light marks enclosing the central black spots are golden yellow above the black spots, and brown-white below; the abdomen fuscous brown and bluish. Expanse of costa 92 mms. The second var. fig. 2, also a ♀, from Myson, New Guinea, has no discoidal mark on the upper wings; all the discal spots are white; the discal light spaces of the hind wings are a grey-white, with a faint rufous yellow, enclosing only small black dots, instead of the usual large dark spots; the abdomen is light coloured, with reddish anal segment. Expanse of costa 103 mms.

In the Dresden Museum.

In reference to these M. Ch. Oberthür tells us that he possesses a specimen nearly like them, but the white spots of the upper wings are more obscure. This example was taken at Amberbaki in 1877 by M. Laglaize.

As these forms are probably representatives of one or more distinct species, I shall defer, until I can figure them, the fuller description which they merit. According to the courteous and kind communication of M. Ch. Oberthür received by me, I learn that his magnificent collection contains 10 ♂ and 4 ♀ examples, and, in addition, 2 examples of the var. of ♀ described by Kirsch.

ORNITHOPTERA POSEIDON.

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|---|--|
| <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">VAR. PRONOMUS.</div> <div style="font-size: 2em; margin-right: 5px;">{</div> </div> | <p>Ornithoptera Poseidon, Doubleday, Annals and Mag. Nat. History, Vol. xix., p. 173 (1847).</p> <p>" " Doubleday and Hewitson, Genera of Diurnal Lepidoptera, p. 43 (1846).</p> <p>" " Westwood, Cabinet of Oriental Entomology, t. 11 (1848).</p> <p>" " ♀ Westwood, Cab. Or. Ent. t. 14 (1848).</p> <p>" " Wallace, Trans. Linn. Soc. Vol. xxv., p. 35 (1866).</p> <p>Papilio Priamus, Var., O. Poseidon, W. F. Kirby, Syn. Cat. Diur. Lepid., p. 518 (1871).</p> <p>Ornithoptera Priamus, Var., Poseidon, Dr. C. Fickert, Ueber die Zeichn. der Gatt. Ornith., p. 709.</p> <p>O. Poseidon, Butler, Proc. Zool. Soc. Lond., 1874 (Lep. of South Sea Islands), p. 288.</p> <p>" Godman and Salvin, Proc. Zool. Soc. Lond., 1878 (Butterflies of New Guinea), p. 647.</p> |
| <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">VAR. ARCHIDEUS.</div> <div style="font-size: 2em; margin-right: 5px;">{</div> </div> | <p>Ornithoptera Pronomus, Gray, Cat. Lep. Ins. Brit. Mus., l. c. p. 2, n. 3, t. 1, f. 1, 2 (1852).</p> <p>♂ Papilio Priamus ♂, Lucas, Lepidoptera Exotica, t. 1 (1835).</p> <p>Ornithoptera Pronomus, Wall., Trans. Linn. Soc., Vol. 25, p. 32 (1866).</p> <p>Pap. Priamus, Var. P. Pronomus, W. F. Kirby, Syn. Cat. Diur. Lepid., p. 517 (1871).</p> <p>Ornithoptera Pronomus, Godman and Salvin, Proc. Zool. Soc., 1877, p. 470 (Butterflies of Duke of York Island).</p> <p>O. Priamus, Var. Pronomus, Dr. C. Fickert, Ueber die Zeich. der Gatt. Orn., p. 706.</p> <p>O. Pronomus, G. F. Matthews, Entomologist, p. 84, Vol. xix.</p> |
| <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">VAR. EUPHORION.</div> <div style="font-size: 2em; margin-right: 5px;">{</div> </div> | <p>Ornithoptera Archideus, G. R. Gray, Cat. Lep. Ins. Brit. Mus., i., p. 3, n. 4 (1852).</p> <p>" Priamus ♀, Boissduval, Voy. d'l Astrolabe, t. 4, f. 1, 2.</p> <p>" " ♀, " Spec. Gen. Lepid. i., p. 174.</p> <p>" Archideus, Wall., Trans. Linn. Soc., Vol. xxv., p. 32 (1866).</p> <p>P. Priamus, Var. Archideus, W. F. Kirby, Syn. Cat. Diur. Lepid., p. 518 (1871).</p> <p>O. Priamus, Var. " Dr. C. Fickert, Ueber die Zeichn. der Gatt. Ornith., p. 709.</p> |
| <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 5px;">VAR. EUPHORION.</div> <div style="font-size: 2em; margin-right: 5px;">{</div> </div> | <p>Ornithoptera Euph Orion, Gray, Cat. Lep. Ins. Brit. Mus., i., p. 4, n. 6, t. 2, f. 3 (1852).</p> <p>" Priamus ♀, E. Doubleday, List of Lep. Ins. Brit. Mus. i., pt. 1.</p> <p>" Euph Orion, Wall. Trans. Linn. Soc., Vol. xxv., p. 32.</p> <p>Papilio Priamus, Var. c. Euph Orion, W. F. Kirby, Syn. Cat. Diur. Lep., p. 517.</p> <p>Ornithoptera Priamus, Var. Euph Orion, Dr. C. Fickert, Ueber die Zeichn. der Gatt. Ornith., p. 703.</p> |

A careful comparative examination of the different forms comprised under the specific names of *Poseidon*, *Pronomus*, *Archideus*, and *Euph Orion* can only bring us to emphatically endorse the opinion of Mr. A. R. Wallace that these are all variants of one species which may be called *Poseidon* of Doubleday. Mr. Wallace included in this group the Aru Island species, with all the numerous specimens taken by him in New Guinea and the adjacent islands. Though we may not be prepared to go as far as that, we may, at least, admit that *Aruana*, *Pegasus*, and *Eumæus* are very closely allied to the others, while they constitute a sub-group, having most of their characters in common, and that the important differences between each of the latter are almost entirely confined to their colours; and though it often is the case that colour variation has little or no specific value, we think it is a noteworthy consideration in the *Aruana* group.

It seems obvious that with *Poseidon* at the head, we have in the four forms named above a group of variations of one species, *Archideus* being the type, with any number of intermediate and slight differences linking all four together—forming a transitive from the Australian *Richmondia* to the Aru Island sub-groups. Just in the same way we see the Bornean *Amphrysus* varying under the names of *Ruficollis* and *Flavicollis*, itself probably having branched off from *Pompeus* or *Helicaon*; similarly there is the case of *Dohertyi*, *Iris*, and perhaps *Plateni* and some others, all of which are closely related.

I, therefore, shall feel justified in assuming that *Poseidon* is a legitimate species, and that *Pronomus*, *Archideus*, and *Euph Orion* are varieties of that species, and as such they will be regarded in this article, though I venture to give

the original descriptions by which the authors made them into distinct species.

O. POSEIDON.

"♂. This species differs from *O. Pronomus* by the rich green colour narrowly extending along both sides of the median nervure, and partly or entirely along the course of the nervules of the primary wings towards the outer margin; and there is not any black spot in the buffy yellow space at the anal angle beneath the secondary wings. The markings beneath the primary wings, and almost the entire surface beneath the secondary wings, are of a yellowish green, with some golden yellow between the row of black spots and the outer margin; the latter is bordered very narrowly with black." [At the time when this description was written the ♀ had not been recorded from Darnley Island.]

The type is in the British Museum.

Habitat, Darnley Island.

See E. Doubleday, Annals and Magazine of Natural History, vol. xvi., p. 173.

"♂. Above, anterior wings with the entire limb deep velvety black, the disc occupied by a broad fascia of the same colour united to the black margin below the apex, divided by the median vein and branches, which are golden green; the inner side more fuscous and opaque; the space between this and the costal and inner margins occupied by two stripes of bright golden—or satiny—

green, shading to bright coppery. The anterior of these is narrow at the base and becomes gradually wider until near the apex of the wing, where it suddenly narrows; the lower follows a direction parallel to the inner margin until near the anal angle, gradually widening to this point, where it is bent abruptly upwards, and extends parallel to the outer margin more than half its length. Hind wings small subtriangular, the anterior and outer margins rounded; satiny green with coppery reflections, the limb narrowly black, the outer margin with one or more spots between the veins; anal margin black, deeply fringed with orange hairs.

"Below, the fore wings have the limb black, broadest on the costa towards the apex, bearing a green spot and two green streaks; the disc green, divided by black veins, and bearing a subcontinuous row of five black spots between the middle and outer margin.

"Hind wings golden green—the golden colour predominating—externally, the anterior and outer margins black with a row of six black spots beyond the middle of the wing, the central spots sometimes preceded by an orange dash; the anal angle broadly golden yellow.

"Head and thorax black, the latter with a long golden vitta above, and a blood-coloured patch on each side beneath the base of the wings. Abdomen golden yellow.

"The ♂ flies high and abundantly in Darnley Island, among the coconut groves."

"♀ Wings black brown; anterior with a rather broad oblique very pale buff bar across the discoidal cell, near its extremity, beneath which are three other irregular spots of the same colour; followed by nine submarginal spots of the same colour, the four anterior of which are elongated; the hind wings marked beyond the middle with a large dirty whitish buff patch, divided by the veins, extending to the anal angle, and bearing four smaller dark brown spots. The wings on the underside are coloured as above, the colour of the pale marking of the hind wings being clearer, with a yellow shade beyond the dark spots. The thorax has a short, brilliant green dash on the upper side, and the sides beneath the wings are brilliant crimson. Abdomen, above, dirty buff; beneath, golden yellow with black dots.

"Habitat, Cape York, N.E. New Holland, Darnley Island, Torres Straits."

See Westwood, Cabinet of Oriental Entomology, page 23, plate 11.

De Haan, "de Verscheidenheid van *Priamus*, afgebeeld in de Reis van Freycinet,"* thus characterises a species which is either *Poseidon* or *Pronomus* :—

"Kleiner den *Priamus*, heeft zij 6' vlugt. Op de bovenvleugels de bruine vlek onder de middelader langer, beginnende reeds aan de Vierde ader. De middelader is groen gezoomd. De ondervleugels hebben op het groene veld geene zwarte punten. Aan de onderzijd toonen de bovenvleugels en de middelcel eene groen vlek, welke derselver half lengte bereikt, en de groen vlekken tusschen de eerste de aders zijn door eenen brederen zwarten

band van elkander afgezonderd. De analhoek der tweede vleugels is geel, met eene Kleine zwarte vlek; het middelvlak is geelachtig groen; de goudgele randvlekken tusschen de eerste aders ontbreken; de zes zwarte vlekken zijn Kleiner."

"This species is smaller than *Priamus*, and has an expansion of wings of six inches; the upper wings with a brown spot under the middle vein longer, and beginning at the fourth vein (or branch); the middle vein is sprinkled with green; the under wings have no black spots in the grass-green area; on the under surface the front wings have the middle cell showing a green spot, which extends half its length, and the green spots between the veins are separated from each other by a wider black band; the anal angle of the second (lower) wing is yellow, with a small black spot; the central spot is yellowish-green; the golden yellow marginal spots between the first veins are missing; the six black spots are smaller.

Wallace (Trans. Linn. Soc., Vol. xxv., page 36) notes some Ornithoptera from Dorey, Salwatty, on the south-west coast of New Guinea, taken by himself, as var. *b.* of *Poseidon*, and remarks: "these agree very closely with *O. Poseidon* as figured by Westwood; they differ individually in the same manner as the last, and also in the length of the lower discocellular nervure on the under wings. They have generally no golden spots beneath the wings. They vary also in the outline of the under wings, the outer and anal angles being more acute in some specimens than in others. Some have the under wings of a uniform green entirely without spots, while others have a range of black spots more or less fully developed."

Mr. Sidney Olliff, of the Australian Museum, in his interesting little Entomological pamphlet on Australian butterflies, p. 39, says "At Darnley Island, when in the *Chevert*, Mr. W. Macleay obtained the larva of the form of *O. Priamus* known as *O. Poseidon*, and I find that agrees in every particular with the caterpillar of the form *O. Pronomus*, recently described by Mr. Matthew, from Thursday Island. Indeed there appears to be very little difference, except in minute points of colour, between these larvæ and that of the very distinct species *O. Urvilliana* from the Duke of York Islands."

To this it may be said that the close similarity or apparent identity of two or more caterpillars may not always be found to prove that they will all produce the same species, though we generally assume that they will; for example, the larvæ of the European geometer moth *Abraxas glossulariata*, so common in many parts of England, varies only a little in colour and markings among a large number of examples, but the imago or perfect insects are subject to a very considerable variation in depth of colour and arrangements of the markings of the wings, so that we rarely find two examples that are absolutely alike; and occasionally the amount of differentiation is so great that if they were brought from a distant country, and their life history unknown the extreme varieties would be accommodated with a distinct specific name. And again, *ad contra*, there are considerable differences between the larvæ of the Noctuid species *Acronycta psi* and *A. tridens*, while it is really difficult, if not impossible, to separate the species from a long series of the perfect insects, though some people think they can do so.

The ♀ of *Poseidon* and its allies vary so much more

* The varieties of *Priamus*, from figures in the "Voyage of de Freycinet," pl. 83, fig. 3, page 183.

than even the ♂♂, that in the same locality it is rare to find two specimens which are absolutely alike, and this applies to all the forms; but there are some special schemes of variation in the white markings of the under wings which suggest the idea of double races for the varieties, to which attention will be called further on; and also the under wings of the species now under consideration are easily distinguished from those of the varieties, though I am unable to believe in a specific difference between them.

The specimens of *Poseidon* in the British Museum are of a much warmer green than those of *Pronomus*, but in other respects there are no differences except that the black spots on the secondary wings are very small (or smaller than in *Pronomus*). The wings of *Pronomus* are a bluer green.

♀. In the Hewitson collection (Brit. Mus.), a rather larger example than others in the museum, the hind wings with slightly smaller and more acuminate black spots in the discal white area, the three lowest are separate from, and the highest or first is united with the other submarginal black by a long indentation of the same colour. The shape of the white marks on the secondary wings are very different from those of the Brit. Museum specimens: the primary wings only exhibit the usual trifling differences; the white area divisions of the disc on the secondaries are almost uniformly hastate nearest the cell between the veins; in a British Museum example they are strongly acuminate. The white fascia of the discoidal cell of the primary wing is also rather broader and more obliquely placed.

Hewitson's specimens of this species are bracketed with *Aruana* of Felder, that is a pair of each species in one group.

O. PRONOMUS.

“♂. In general appearance it is like that of the *P. Priamus*, but is rather smaller, and the primary wings (besides the prominent bands of rich green) have the outer side of the median nervure and more or less of the base of the median nervure ornamented with the same rich green. The secondary wings have the outer margin much narrower than in *P. Priamus*, but with three rounded black spots, one on each space between the costal nervure and the discoidal nervure; the spot that is situated between the 2nd subcostal and discoidal nervules is sometimes very small; beneath each of these spots is, in some specimens, a small golden spot.

“The under surface of the primary wings is marked very similarly to that of *P. Priamus*, but the golden green partakes of a bluish tinge throughout its surface. The under surface of the secondary wings is also similarly marked, but the general surface is bluish, with the marginal portion golden green; the golden spot above the blue spot between the costal nervure and the 1st subcostal nervule is of a more lengthened form, though it is sometimes very small; the golden spot below the 2nd, 3rd, and 4th black spots is not so prominently marked as in *Priamus*; the outer black margin is very narrow, and the anal angle is buffy yellow, with a black heart-shaped spot, while in *P. Priamus* this space is black, with a small buffy yellow mark.”

“♀. This sex agrees better with the figure given in the *Voyage d'I Astrolabe*, t. 4, than with any figure that represents the ♀ of *P. Priamus*; but it differs from it by the marking in the discoidal cell of the primary wings being more diffused towards the discocellular nervules; the other white markings are similar in position and form, but in some cases they are rather larger. The secondary wings are also like the above-mentioned figures; the four large buffy white spots between the nervules retain somewhat of the tear-shaped form, especially that occupying the two spaces between the 2nd subcostal and the 1st median nervules; but none of the spots advance to the discocellular nervules, nor to the median nervure, nor is there any white spot within the discoidal cell, as is represented in that figure, though they possess the black spot in the middle of each; the anal angle is buffy white, showing the black spot that exists on the under surface; and at the anterior angle there are two buffy-white spots.

“The under surface of the primary wings is like the upper; but the mark in the discoidal cell is not so diffused. The under surface of the secondary wings is also like the upper side; but the two spots at the anterior angle, and the outer portion of the space between the nervules are a rich yellow; and the space at the anal angle is equally as prominent as the others.” [In the collection of the British Museum.]

Habitat, Cape York, N: Australia.

[See Gray's Catalogue of the Lepidopterous Insects in the British Museum.]

The following notes on examples in the British Museum and Hewitson collections may be useful.

♂. On the secondary wings are three black discal spots, and outside the two lowest are two golden spots nearest the margin; of the 3 black spots the upper one is rectangular, and the two below are quadrate in form. [British Museum Coll.]

♂. This specimen is labelled *Archideus*. The anterior wings green, with subcostal and marginal bands very narrow—commencing at the base of the interior margin, and being quite continuous along that and the exterior margin to within a little of the apex; with a green atomic line half-way along the median nervure from the base; also with the three median nervules, except where interrupted by the sexual brand, with similar green lines; part of the submedian nervules also treated in the same manner. Secondaries with four black spots: the lowest one being very small and rudimentary; the black margin very narrow and sinuate.

This example has somewhat the appearance of *Richmondia*, especially on the under surface.

Length of costa 69 mms. [British Museum Coll.]

♀. With the submarginal light area of the secondary wings a little more buff-coloured than in the type, and the discoidal-cellular white fascia of the primaries narrower than in other examples. [British Museum Coll.]

♀. A small example, with a very small white spot within the discoidal cell at its distal end above and below, close to the nervules. [Hewitson Collection.]

Comparative lengths of the costa of 3 examples of the ♀ in the British Museum, 82 mms.; 89 mms.; and 100 mms.

♀. Primaries with the central patch in the discoidal cell more quadrate and more irregular in the form of the excision at the distal end, than in the type. [Brit. Mus. Coll.]

♀. The white patch within the discoidal cell is about half the size of that of the type, and finer in colour; its basal side lunate, the distal side dentate, with white atoms projecting on either side. The light discal area of the secondaries is not quite continuous. The first or upper division contains two black spots of unequal shape, one below the other; the upper parts or points of the light area (*i.e.*, between four of the nervules) are somewhat hastate in form; the central black orbicular spots are small. [British Museum Coll.]

O. ARCHIDEUS.

Gray, in the "Cat. Lep. Ins. B. Mus." speaking of his female *Archideus*, says: "This species agrees in many particulars with the ♀ of *O. Pronomus*, but the white of the secondary wings reaches to the discocellular nervules and a portion of the median nervures, and it also occupies a small space within the discoidal cell, while the black spots between the nervules are of a larger size."

Wallace, referring to the same ♀ form from Waigiou, "Trans. Linn. Soc." Vol. XXV., p. 32, observes: "This agrees with the last" (*Poseidon*). "The ♂ is a more delicate green than any of the others, with less of that colour on the median veins. On the underside there are no golden spots. The whole surface has a golden tinge, and the central portion of the lower wings is tinged with amber brown." And Wallace goes on to say that the ♀ ♀ of the above vary considerably, much more than the ♂ ♂ do. That it was seldom that even in the same locality two were found alike in pattern. But this may generally be asserted of any of the species of the genus *Ornithoptera*.] In some examples more than half of the discoidal cell is occupied by a whitish patch, while in others there are only a few small spots. [These will be seen to be fragments of the general large patch broken up by the pseudoneura till sometimes they become almost obsolete.] "One specimen from Salwatty, almost exactly agrees with that figured by Westwood (Cat. of Oriental Entomology, Pl. 14) as from Cape York. One Waigiou specimen is the same as *Archideus*, G. R. Gray, figured by Boisduval (Voyage de l'Astrolabe t. 4, f. 12); and another from New Guinea differs very little from *Euphorion*, G. R. Gray (B. M. Cat. Lep., pls. 1, 2, fig. 3) from North Australia." From which Mr. Wallace draws the inference, which a close study of a large number of the different forms enables us also to accept, "that a variable form (or species) is spread over an extensive area, and kept variable by continual intercrossing of individuals, which would otherwise segregate into distinct and sharply defined races." This variability, however, is not a unique characteristic of the species under consideration, for the ♀ ♀ of *O. Urvilliana*, and in a lesser degree, of *Aruana*, are nearly as unstable in pattern—the latter being so much more restricted in area notwithstanding.

O. EUPHORION.

The ♀ was alone described by Gray, as from N. West Australia; and has been generally supposed to be a variety of *O. Cassandra*, which probably it is. Mr. Walter W. Froggatt, the Government Entomologist for New South Wales, in his letter to me, kindly mentions Miskin's opinion that *Euphorion*, Gray, is a synonym of *O. Cassandra*, "which is the common species from Mackay to Cooktown, in Queensland." He informs me that he has taken a good many on the Russell River, near Cairns, North Queensland. At any rate a ♂ labelled *Euphorion*, now before me, from the collection of Mr. Henry Grose-Smith, is certainly so like the ♂ of *Cassandra* on the lower-side, that if I were to only examine that surface I should not hesitate to regard it as belonging to that species, but the upper surface of the primaries has the median vein and its branches well defined with green atoms, a feature so characteristic of the different ♂ varieties of *Poseidon*; whereby we obtain a strong hint of the close relationship between *Poseidon* and *Cassandra*.

The following is Gray's diagnosis of *Euphorion*:—"♀. In size and general appearance it approaches very near the ♀ of *O. Pronomus*; but the band in the discoidal cell of the primary wings contains a small spot which is also the case with the white between the 4th and 5th subcostal nervules; and the one between the 5th subcostal and discoidal nervules is divided into two unequal parts; the spots near the median nervure, between the 1st, 2nd and 3rd median nervules are smaller; the tear-shaped spots on the secondary wings are of a less size, and more distinctly formed, while the dark fuscous spot in the middle of each is much larger than those of any other species known; the spot in each space between the costal nervure and the 2nd subcostal nervure is ochraceous; as is also the space at the anal angle. The white spots of the upper surface are all speckled with minute black specks, and so is the ochraceous spot between the 1st and 2nd subcostal nervures. The markings on the under surface of all the wings are similar to those on the upper side, both in shape and colour. Several specimens of this butterfly were brought from the interior of the northern portions of Australia by the late Allan Cunningham, and they were all of the same sex."

The type ♀ of *Euphorion* is in the British Museum, and was taken at Port Denison. It is not quite symmetrical in pattern: the left wing has one wavy oval dot that is not found on the right wing. The discocellular patch is large, and somewhat irregular in outline towards the discocellular nervules—rather sinuate towards the base. A second example from Queensland, has the cellular patch transversely narrower, and dentate towards the discocellular nervules: all the other light marks are small or broken up, especially the 3rd long discal mark which is almost X-shaped. A third example (*ex-coll.* Druce, *ex-Godman et Salvin*) has the cell mark transversely, very irregular, narrow and wavy; and the discal area of the posterior wings is sordid white and sordid yellow. A ♂ with one golden adnervular spot on the posterior wing, and a second example with only one golden apical spot. Hab. Queensland. Other ♀ examples of this form are very dark—the cell mark generally very oblique, narrow, often more or less divided—sometimes with the upper portions of the mark left, or the lower ones only very small: the stray white marks of the wings generally small or mere dots, except the 3 or 4 on the upper part of the

wing—sometimes nearly or quite absent. One example from Lizard Island has all the wings nearly melanistic. The anterior wing has really only 6 marks, and the posterior wing only 3 acuminate marks almost obsolete, and 3 sordid yellow submarginal patches. Hab. Queensland.

The other examples of the type form *Poseidon* in the British Museum may be thus tabulated:

A ♀. Very large bold marks in the cell, and on the wing generally: the cell spots are well dusted with atoms. The posterior wings bright grey-white, with nearly equal sized subconical spots, and greyish-yellow beneath, or warm creamy ochraceous-white on all the wings.

A ♂. The median green line of the anterior wing only moderately broad.

A ♀. Near *Kirschi*—very dark, with bright white marks on anterior wing: the cell mark not quite as broad and regular as usual. Hind wings a very rich golden yellow, subdued by grey dustings below the 4 large subconical black spots; the apical spot is of the same yellow, as are the fringe lunules and the abdomen. Hab. Waigiou, Dr. Platen.

Two ♀♀ from Salwatty are lighter. The examples from the Entrecasteaux Islands have the white marks of the general size, but more subdued by the grey atoms; in one example the anterior wing-spots are almost obsolete.

A ♂ from New Guinea is larger than the Australian ♀♀, with a broader median green vein line on the anterior wing than usual.

A ♀ from the same locality with the hind wing yellow, like *Kirschi*.

Two ♀♀ from Dorey with the posterior wings above white and reddish-yellow: the cell marks of the anterior wings strongly excised towards the base.

The examples of the ♀♀ from the Arfak Mountains of New Guinea are very large: the ♂♂ are more like those of *Aruana*; but one from Waigiou on the under surface resembles *Cassandra*.

There are also 5 females with their anterior cell-spots large and more or less excised; one is more square and dusted with grey atoms.

The ♂♂ from Duke of York Island are very large, and very golden green on the under surface of the posterior wings: the green subcostal band is narrow, and regular in breadth; the submarginal green band is broad and undivided by the veinlets, in one example nearly to the apex.

Of 2 ♀♀ from Torres Straits, one example must be referred to *Aruana*. One ♂ from the same locality with 2 obliquely-placed elongated black spots on the hind wing subdued by atoms; the other examples with 3 orbicular discal black spots.

A ♀ from Wokau (Aru Islands) with the anterior cell-mark occupying nearly the whole area—being very large, and continued by bluish-grey atoms towards the base.

The ♂ var. *Oceanus*, Felder, from the Aru Islands, is bluish-green, with only one black discal oval mark.

The females of *Archideus* are generally very large, and warm reddish-brown in colour on all the wings—becoming very light reddish-brown towards the apex of the anterior wings:—still lighter on the same portion of the under surface—though the rest of the wing area on the under

surface is darker brown towards the base; the posterior wings on the same surface are almost equally light rufous-brown from the base, and the darker parts are normally dark brown on the submarginal areas. The result is that on the under surface the veins all stand up very conspicuously on all the wings, but are barely visible on the upper surface, except in the light or reddish-grey discal area of the posterior wings—the grey being densely subdued by the rufous-brown scales. The discocellular patch is very large—and transversely straight on the basal side, as in most of the forms of *O. Poseidon*; all the other marks are large or prominent, and are all intensely subdued by the rufous-brown atoms or scales. The size, shape and number of the marks on the underside are the same, but warm creamy-grey, with little or no scaling; on the posterior wings the discal light area is of the same tint, but the apical mark, the next below, and all the spaces below the discal black subconical spots are a delicate ochraceous orange, sparsely scaled:—in some examples this orange is not dusted or scaled. Two examples before me from Waigiou, one in the coll. of Mr. H. Grose-Smith, and the other in my own, answer exactly to this description.

A ♀ of *Poseidon* in Mr. H. Grose-Smith's collection from Waigiou (Wallace) is very dark brown on the upper side—the veinlets scarcely visible; the discocellular mark is transversely long, rather narrow, and nearly straight on both sides; all the other marks are very pure in their creamy-grey tone, and very prominent; the hind wing has a small light spot at the end of the cell, and the discal light area is delicately graduated by the rufous-brown scales till, below the discal black spots, it is an equally-toned greyish rufous-brown. The marks on the underside are similar—but the light discal area of the hind wings is delicately suffused with lemon-orange.

Another ♀ in the same collection from Stevensort Interior, one of Wallace's specimens, and one from Cape York, in the Hope Museum at Oxford, are similar in pattern: but the anterior cell-marks are broader, more irregular in outline, and more or less scaled; and there is no posterior white cell spot.

Messrs. Godman and Salvin, "Proc. Zool. Soc." 1878, p. 647, in their article on Butterflies from New Guinea (collected by Dr. Comrie, remark:—"Some of the ♀♀ of *Poseidon* from Possession Bay, have the primaries spotless brown; others show a trace of the light-coloured spot near the end of the cell. The specimens from d'Entrecasteaux Islands are strongly marked, indeed as much so as a ♀ example of *O. Aruana*. The one ♂ seems to agree with the typical species of *Aruana*, the apical angle of the secondaries being perhaps rather less acute; but the difference is very slight. Comparing this with Montrouzier's description of his *O. Boisduvalii*, from Woodlark Island (no great distance from Dr. Comrie's locality) we find it agree in every respect." These therefore are evidently examples of Rothschild's aberration *Brunneus*.

VAR. BRUNNEUS.

Troides Priamus Poseidon, ♀ ab, brunneus, Walter Rothschild, "Novitates Zoologicae," Vol. II, p. 189 (1895).

♀. Anterior wings entirely spotless dark brown above, with a slight very faint clouding of the portion of the disc around the 3 median nervules; the veins fairly well shown; but the median nervure from the

base, and also the submedian for a short distance, are rather swollen; the fringe lunules rudimentary and white. Posterior wings dark brown, or bronze black, lightened from the base by paler brown hairs; the grey discal area consists of 4 internervular acuminate marks, separated by or containing the conical dark marks which coalesce with the dark veinal portions—thereby dividing three of them into two separate parts—the upper part of one being reduced to a small speck; the lower portions of all are subdued to a dark warm grey-brown by scaling, and the outlines of all are softened into the dark by grey scales; these, together with a subapical mark and a fifth division of the light discal area at the anal angle, constitute a discal band of grey marks, or a light discal area narrower and of a different character from the general light area of the other vars. of *Poseidon*. Under surface of the primaries with one half the cell and the middle portion of the disc a lighter brown than above; with 2 faint light marks, the first and faintest between the 1st and 2nd, and the second and lightest between the 2nd and 3rd median nervules; below the 3rd median nervule and the submedian fold is a small grey speck. Posterior wings similar in markings to above, except that they are purer in tint, grey or light orange, and more decided in outline, and altogether constitute an ideal discal band of light marks, 7 in number, extending from the subcostal to the anal angle—the lower 5 enclosing large conical black spots. Length of costa of anterior wing, 95 mms.

The abdomen greenish-grey above, except the penultimate and anal segments, which are ochraceous; beneath brownish golden-yellow; the lateral black dots well shewn; thorax velvety brownish-black, with a slight indication of the usual green longitudinal stigma; on the underside the pectoral red patches in which the 2nd and 3rd pairs of legs are imbedded are sufficiently prominent.

In the collection of the University Museum, Hope Department, Oxford.

Hab. not stated.

♀. In Mr. H. Grose-Smith's collection. Anterior wings rather lighter brown; with 1 small rudimentary light cell spot—(i.e. the lower fragment of the general cell spot of *Poseidon*); and 8 or 9 irregular-shaped fragments of the general discal and submarginal marks; the fringe lunules a little more prominent, and ochraceous. Posterior wings with the pattern similar in character to the Oxford example, but greyer, more regular in outline, and approaching the character of the general *Poseidon* form. Underside of all the wings more nearly like that of the Oxford example, save that the cell mark is rather larger, and most of the anterior wing-marks and dots are more or less rudimentarily present. Abdomen grey above and orange beneath. Length of costa of anterior wing, 102 mms. Hab. Stevensort Interior.

The anterior wings of this form are rather more acute at the apical angle than in *Poseidon*; and in the *Archideus* form they are still more acute or pointed—the latter being also rather longer in proportion to the hind wings than in *Brunneus* or *Poseidon*.

Mr. Rothschild's diagnosis of this variety is as follows:—"White markings on upperside of fore wings entirely obliterated, except a point-like spot between the lower median nervules," and, he says, "this remarkable aberration has been found by Mr. A. S. Meek, on Fergusson

Island, D'Entrecasteaux Islands; among some hundreds from that locality there are all intergradations between this aberration and ♀-ab., *Archideus* (Gray)."

There appears to be no distinctly variable ♂ belonging to this variety. Probably the plastic character of the ♀ is absolutely necessary to ensure its safety in its special environment.

We may safely say of the species *Poseidon* and its many varieties or local forms, whether we agree with or differ from the decision of Mr. Rothschild as to the named forms to be included as varieties or aberrations, that among its females we are never likely to meet with two examples which are exactly alike; and, according to Mr. Rothschild, after an examination of a large number of individuals, say from any special locality such as Waigiu or German New Guinea, all the local forms which he enumerates, were found together; whilst he tells us that only a small proportion of the specimens from the Aru Islands represent the typical *Aruana*, from Waigiu the typical *Archideus*, or from Cape York the typical *Pronomus*.

Among the genuine or hypothetical vars. and aberrations the following are included:—

Euphorion Gray, *Pronomus* Gray, *Archideus* Felder, *Cronius* Felder, *Triton* Felder, *Oceanus* Felder, *Brunneus* Rothschild, *Pegasus* Felder, *Kirschi* Oberthür, *Aruana* Felder, (its var. *Valentina* Viellot), *Hecuba* Röber, *Eumæus* Rippon, *Goliath* Oberthür, and, to be consistent, *Cassandra* Scott (which Mr. Rothschild affirms is one of the numerous individual aberrations of *Euphorion*). Several of these varieties (or so-called species) are, I admit, based upon characters which may be found to re-appear in some of the other named varieties on examining a long series—characters which are of small value; but, as far as the series of forms ranging from *Priamus* to *Urvillianus* are concerned, with one or two exceptions, it is not easy to say off-hand of one particular example of the ♀, and often of the ♂, why we should give it one name more than another. We have a similar difficulty to encounter with many of the named forms of the Genus *Pompeoptera*, and also with many of the South and Central American Ornithoptera.

It would, of course, be easy to include the whole of the members of the Genus Ornithoptera in one great plastic or variable species; and as a matter of fact this is what is tacitly done by most authors. I would however venture to slightly modify this wholesale treatment of the genus, and propose the following arrangements in the absence of a fuller knowledge of the life history of the different forms:—

1. Species *Priamus*, Linn.; S. Moluccas: Amboina, Ceram.

2. Species *Richmondia*, Gray; New South Wales: Rockhampton, Richmond River. [This may be only a subspecies of *Priamus*.]

3. Species *Cassandra*, Scott, *Euphorion* of Rothschild; N. Australia: Queensland. [This is either a sub-species of *Priamus*, or a large local variety of *Richmondia*.] In *Richmondia* and *Cassandra* the white patch of the cell of the anterior wings varies in size from some almost obsolete minute spots to a patch occupying a large part of the cell; but in *Priamus* there is no cell patch at all.

4. Species *Poseidon* (Doubleday); Darnley Islands, includes vars. :—

- a. *Euphorion* (?)
- b. *Pronomus*; Cape York, Australia, and Thursday Island.
- c. *Archideus*; New Guinea, Waigiu.
- d. *Cronius*; New Guinea. Upper surface of posterior wings without black or yellow marks.
- e. *Triton*; Rawak.
- f. *Oceanus*; Felder gives no locality.
- g. *Brunneus*; d'Entrecasteaux Islands (a locality where many lovely new butterflies were obtained by Mr. Meek).
- h. *Pegasus*; New Guinea, Dorey, Humboldt Bay.
- i. *Kirschi* (a var. of *Pegasus*); New Guinea.
- j. *Aruana*; Aru Islands.
- k. *Valentina*; Port Moresby (based on dwarfed specimens of *Aruana*).
- l. *Hecuba*, Key Island.
- m. *Boisduvali*; Woodlark Island. Like *Poseidon*. Mr. Rothschild gives in addition a notice of specimens of some of these forms received by him from the Islands of Torres Strait, the Louisiade Archipelago and d'Entrecasteaux Islands.*

5. Species *Cræsus*, Wallace; Batjan (or Batchian).

6. Species *Lydius*, Felder; Ternate, Halmahera, Gilolo. Important differences from the male of *Cræsus*, and an entirely different pattern of female, are sufficient reasons for regarding this as a distinct species, at any rate till we find that the species is dimorphic, which, as I have said elsewhere, is probable.

7. Species *Urvilliana*, Guérin; New Ireland, Duke of York Island, Solomon Islands.

- a. *Bornemannii*, Pagenstecher; New Britan, green var.
- b. *Eumæus*, Rippon; (no locality). A transitional variety between *Poseidon* and *Urvilliana*.

In these 7 species of the genus *Ornithoptera*, I do not include Oberthür's *Goliath*, which as I have shown elsewhere belongs to the genus *SCHOENBERGIA*.

A variety of *Poseidon* in the Tring Museum is mentioned by Mr. Rothschild as having the median vein of the male forewing without green scales.

My *Eumæus* has blue-green scales on its median vein—thereby suggesting its close relationship with *Poseidon*.

A var. of *Brunneus* ♀, in the coll. of the Hon. W. Rothschild, has the white patch of the cell of the anterior wings obliterated, but the discal markings are present.

Another var. has the white patch of the anterior wing cell, occupying nearly the whole area of the cell.

* In the ♂♂ of most of these forms the median nervure of the forewing is more or less accentuated with green scales, as are also the median nervures as far as the sexual stigma or brand. Occasionally some of the other nervures are also thus distinguished slightly. This is not the case with *Priamus*, *Richmondia*, or *Cassandra*.

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- Papilio Poseidon*, Gray, Cat. Lep. Ins. Brit. Mus., I. p. 3, n. 5 (1852). ♂.
- " " " List Lep. Ins. B.M. I. p. 3, n. 5 (1856). ♂.
- " " " Felder, Verh. z. b. Ges. Wien., p. 290, n. 17, and p. 333, n. 13 (1864). ♂.
- Ornithoptera Archidæus*, Feld., Wien. Ent. Mon. III., p. 264, n. 12 (1859). ♂.
- O. Poseidon*, Vollenhoven, Tijdschr. v. Ent. III., p. 70, n. 2, and p. 89 (1860). ♂♀.
- " Ribbe, Iris III. p. 41 (1890) ♂♀.
- " Tryon, Report of the Administration of British New Guinea, II., App. v. p. 112 (1892).
- Papilio Triton*, Felder, Verh., z. b. Ges. Wien., p. 290, n. 16, and p. 332, n. 12 (1864). Rawak ♂.
- Ornithoptera Pronomus*, Koch, Indo-Austral. Lep. Fauna, p. 37 (1865).
- " " Mathew, Tr. Ent. Soc., Lond. p. 168 (1888).
- O. Priamus*, Var. *Pronomus*, Semper, Journ. Mus., Godeffroy, Heft. 14, p. 41, sub. n. 128 (1878). ♂♀.
- O. Priamus*, Var. *Hecuba*, Röber, Tijdschr. v. Ent. XXXIV. p. 263 (1891) ♂. Key Island.
- Troides Priamus Poseidon*, Rothschild, Nov. Zool. Vol. II., p. 188, et seq. (includes *Cronius*, *Triton*, *Eumæus*, *Archideus*, *Kirschi*, *Pegasus*, *Aruana*, *Hecuba*, *Valentina*, *Goliath*, *Brunneus*, and Aberrations). (1895).

ADDENDA TO PROCEEDING PAGES.

ORNITHOPTERA PRIAMUS.

♂♂. The number of the black subdiscal spots on the posterior wing varies in this type species, and appears to set the fashion in this particular to all its derivative forms, including even *Urvilliana*. In a series in the Tring Museum, 8 examples had 4 spots each; 3 were ornamented with 5 each, and 1 example had only 2 small spots. The number of spots on the undersurface of the wing also varies, but is generally 6 or 7. It would appear from my examination of a considerable number of examples, that the more numerous these spots are, the larger is their size; where there are only about 2 on the wing they became very small or rudimentary.

In the Tring Museum there are 11 specimens from Amboina and 3 from Ceram. The size of the species is also subject to considerable variation, though not so much as in others of its derivative species. There is one example at Tring nearly the size of a *Richmondia*, and another smaller. But this is really the largest of the species as far as the ♂ is concerned.

♀♀. Vary very much in depth of colour: some being very melanistic, others very light; often it is the lower wing that is melanistic, and the upper wing that is lightest: but every gradation between the two extremes may be met with. There is also a similar gradation in the size and distinctiveness of the markings, for in some even the darker marks are often greatly subdued in tone. There are 11 examples from Amboina in the Tring Museum.

The rule is that the anterior wing discoidal cell of the ♀ is immaculate; but I have seen 2 or 3 examples where a small spot occurs. There is one in the Brit. Museum, *ex Godman et Salvin coll.* It is from Ceram. In the same collection there are 4 ♂♂ and 4 ♀♀, three of the latter very dark, and one red-brown. The Staudinger collection contains 6 ♂♂ and 6 ♀♀, from Amboina and Saparua, also the Pupa; the Nat. Hist. Museum 4 examples of each sex. In the Hope Museum, Oxford, are 2 ♂♂ and 3 ♀♀.

O. CASSANDRA, (*EUPHORION*, OF GRAY).

♂. The subdiscal spots on the posterior wing, 4, 5, or 6, the anterior spot often very large; the golden yellow submarginal spots (on the yellow band of the undersurface) vary from 0 to 5, and the same above.

In the Staudinger Coll. 6 ♂♂, 5 ♀♀; at Vienna 3 ♂♂, 1 ♀; at Tring 41 ♂♂, 25 ♀♀, also larva and pupa.

♀♀. The anterior wing cell-spot very variable. In some the light cell-mark is moderately small, and nearest the costa; in two examples the spot is ideally divided into 5 parts, the middle part absent; in one the mark occupies 1-6th of the cell, and is homogenous; in one the

mark is divided into 4 small parts, and the specimen is large; in a number of others there is every gradation of size, some being very large, others very small. The marks on the posterior wings are also nearly obsolete. Length of costa varies from 71 to 95 mms.

5 ♂♂ from Queensland and 1 from Cape York; also 1 ♀ including the type from N. W. Australia, and 1 from Cape York, are in the British Museum.

One of these examples of the ♀ is from Lizard Island: the wings are very melanistic,—the anterior wings with only 6 light marks, and the hind wings only have 3 acuminate marks, which are almost obsolete, and 3 sordid yellow spots. In the Brit. Museum series the anterior cell mark is generally oblique, narrow, often more or less divided, sometimes only the upper divisions appearing, sometimes only the lower: and the other white marks of the wing are generally small, even reduced to mere dots.

In the Dublin Museum are 1 ♂, 1 ♀, from the Cairns district of Queensland.

O. RICHMONDIA.

There is really little or no important difference between this and *Cassandra*, except in size, and the two can only be regarded as local forms—the size being determined by some distinct quality of the food plant peculiar to each locality. In every respect the scales possess the same varying tones of colour and character of markings, to a remarkable degree in each form, so that the descriptions of any number of specimens of one would exactly fit those of the other, except in size—and even here there is often an approach to each other.

Of *Richmondia*, from Richmond River, N. S. Wales, the Tring Museum possesses 10 ♂, 8 ♀, and the larva and pupa. My own collection 7 ♂, 5 ♀; Vienna Museum 3 ♂, 1 ♀; Staudinger coll. 7 ♂, 4 ♀; Brit. Museum 1 ♂, 1 ♀ from Moreton Bay, 5 ♂ Queensland, 1 ♂ Richmond River, 3 ♀ *ibid loc.*, 1 example of disquimated ♂ wings; in the Dublin Museum 1 ♂, 1 ♀.

In a very courteous letter sent to me by Mr. Walter W. Froggatt, the Government Entomologist of N. S. Wales, he remarks: "this species is common on the northern Rivers of N. S. Wales and southern Queensland (Marochy River is its northern limit), but it does not come very far south below the Clarence River. The specimens sent were taken about 6 miles from Lismore. *O. Cassandra*, Scott, is the common species from Mackay to Cooktown in Queensland. I have taken a good many on the Russell River near Cairns, N. Queensland. . . . I have bred them from larvæ obtained in the same district. The larva is of a rich black velvety colour, slightly spined with fleshy tubercles on the sides, and a rich crimson blotch on either side of the thorax."

O. PEGASUS.

- O. *Pegasus*, Grose-Smith, Nov. Zool., p. 331, n. 1 (1894). Humboldt Bay, ♂ ♀.
 „ var., Pagenstecher, Jahrb. Nass. Ver. Nat., p. 63, n. 1, t. 3, f. 1 (1894).
 ♂ New Guinea.
 „ Rothschild, Nov. Zool., Vol. II., p. 189 (1895).

In the Staudinger coll., from German New Guinea 6 ♂, 8 ♀; from Molne Bay, S. New Guinea, 2 ♂, 3 ♀; Pupa from Laro and Obae. By most authors *Pegasus* is considered to be a form of *Poseidon*; and it is really impossible to object to this arrangement. The type form of Felder was probably discoloured, and so misled us all in estimating its specific value. Many examples of the ♂ have since come that do not appear to differ from those of *Aruana* or *Poseidon*. There is 1 ♂ in the Brit. Museum, ex Godman et Salvin coll., resembling Felder's type; but the late Mr. Salvin told me he did not believe in it.

O. POSEIDON

(INCLUDING ITS MANY SYNONYMS).

In the Tring Museum: from N. Guinea 52 ♂, 46 ♀; Waigeu 8 ♂, 12 ♀; Salwatty, Mysol, Key Islands, Aru Islands, 12 ♂, 9 ♀; Islands of Torres Straits and Cape York 7 ♂, 6 ♀; Louisiade Archipelago and D'Entrecasteaux Islands, many examples.

Var. *Brunneus*, with the marks of the anterior wings obliterated, except a point-like spot between the lower

median nervules. A ♀ is also in this collection, with the anterior cell mark graduated into the ♂ quality of green—a singularly abnormal aberration. In the *Vienna Museum* 2 ♂, 1 ♀, New Guinea; 1 ♀, Banda Island. In the Staudinger coll., 1 ♂, 1 ♀, Cape York; 5 ♂, 4 ♀, Aru (Aruana?) var. 2 ♂, 2 ♀. Toal Key, 3 ♂, 4 ♀; Great Key Island, 1 ♂, 1 ♀; Koor Island, near Key Island, a var. 2 ♂, 2 ♀; Waigeu, v. *Cronius*, 1 ♂; 1 ♂, locality unknown. In the *Brit. Museum*, Duke of York Island, 2 ♂ (very golden green hind wings on the under-surface). New Britain 1 ♂; Duke of York Island 2 ♀; Torres Straits 3 ♂ (with yellow subcostal mark on the hind wing), 2 ♀; (the lighter resembles a ♀ *Urvilliana*). The median veins of the ♂ anterior wings vary greatly in the intensity and extent of the green scales which accentuate them; 1 pupa; Darnley Island, Torres Straits, 1 ♂, 2 ♀; 1 desquamated ♂; Cape York, 6 ♂ (in 2 examples there are no green scales on the anterior wing median vein. Cape York 1 Pupa; Cape York, 2 ♀, Australia, 1 ♀; Wokau (Aru Islands) 2 ♂, 1 ♀ (the anterior cell marks nearly fill its whole area); 1 Pupa, Aru (Wallace), 1 ♂ labelled *Oceanus*, (fide Butler), 4 ♂; Aru Islands, 3 ♀, belong probably to *Urvilliana*, 1 ♀ is the normal *Aruana*.

A ♀ *Poseidon* from the Arfak Mountains of N. Guinea has the anterior wing cell mark very large and indented towards the base; in 5 ♀ examples the cell spots are all more or less incised; in 1 ♂ from the Duke of York Island, the green subcostal band is narrow and regular in width, and the submarginal green band is broad, and only dimly divided by the veins, and reaches nearly to the apex.

For reference to other forms refer to p. 22 of this vol.

ORNITHOPTERA ARUANA.

Ornithoptera Aruana, Felder, Wien. Ent. Mon. III., p. 391. n. 32. (1859).

" " " Lepidopterologische Fragmente. p. 24. (1859).

" " Wallace, Trans. Linn. Soc. XXV., p. 36. (1865).

Papilio Aruanus, Felder, Reise Novara, Lep. I. p. 3. n. 1. t. 1. (1865).

O. Aruana, Salvin and Godman, Proc. Zool. Soc. 1877, p. 147.

P. Arruana, Kirby, Syn. Cat. Diur. Lepid. p. 517. (1871).

O. Aruana, P. H. Gosse, Clasp. Organs in Certain Lepidoptera, Trans. Linn. Soc. Vol. II., 2nd. Ser. p. 282. pl. xxvi., figs. 1-3. (1883).

" Fickert, Ueber die Zeich. der Gatt. Orn. t. 705. figs. 3, 4. Taf. xx. (1889).

[Mentioned also by Dr. F. Walker, in his Paper on Oriental Entomology, pt. ii., p. 11. (1889).]

Mr. A. R. Wallace, "*Papilionidæ* of the Malayan Region," in vol. 25 of the Trans. Linn. Soc., tells us that the numerous specimens of *Ornithoptera* which he obtained in the various parts of New Guinea and the adjacent islands exhibited so much instability of form, colouring, and even of neurulation, no two individuals being exactly alike, that he felt compelled to include them all in one variable species; and he also considered that *Pronomus*, Gray, from Cape York, *Euphorion*, Gray, from W. Australia, *Archideus*, Gray, from N. W. Australia, and *Boisduvalii*, *Montrouzier*, from Woodlark Island, should all come into the same category. It is very difficult to think that he was wrong.

Consequently he refers to the form which he discovered in the Aru Islands, [the home of the King Bird of Paradise (*Paradisea regia*), the Black Cockatoo (*Microglossum aterrimum*), the Racquet-tailed Kingfisher (*Tanysiptera hydrocharis*), the *Paradisea apoda*, the Spectre Butterfly (*Hestia durvillei*), the Pale Peacock Butterfly (*Drusilla calops*), the magnificent and rare Clear-wing Moth (*Cocytia durvillei*), and multitudes of ravishingly beautiful things besides,] as "*O. Poseidon*, var. *a* (Wall), (*O. Aruana*, Felder)," and remarks that "individuals from this locality differ in the arrangement of the nervures; in some the 3rd subcostal nervure of the upper wings branches from the same point with the upper discocellular, in others considerably beyond it; the points from which the subcostal nervures branch also vary. The amount of green colour on the median nervure and its branches varies. In some specimens there is a spot at the anal angle of lower wings beneath, agreeing with *O. Pronomus*, G. R. Gray; but this is generally wanting." But the var. was considered as of sufficient distinctness to merit a specific description by Felder, under the name of *Arruana* (*Aruana* it should have been), the most important features of which I give below.

♂. Wings silky green; narrowly bordered with black. Anterior wings above with a broad costal longitudinal discal band or stripe; a patch of velvety fuscous, surrounded by black; the median vein sparingly scattered over with green atoms. Under sides, tawny black; within the cell an elongated patch of green, a subcostal stripe, and without 7 widely separately greenish patches. Posterior wings, over the discoidal cell sprinkled with blackish atoms; with a coppery golden spot on the costa (which also appears on the under side), and 6 large black submarginal spots. Under sides, diluted green; the base and 7 large spots opposite very black; the subcostal and discoidal veins are also margined with black; anal angle yellow. Thorax black and hairy, with a green centre above, and red on the sides beneath.

Abdomen yellow: the anal spot, and the lateral dots are black. ♀. Wings on both sides tawny black. The anterior with a subquadrate oblique cellular patch, and 8 exterior elongated separated marks; the upper ones ashy white, the lower of a more sordid colour.

Posterior wings above, with greyish yellowish nervules; a small costal, with an apical sinuated spot sordid ashy white, and 5 other posterior, large, elongated marks, unconnected with the cell ashy white; outside tawny smoky; the first cut off, and including a big yellow spot; each in the following group sinuated at the outer end, ornamented in the centre with a small orbicular tawny spot, the interior marginal one being rather narrow, and embracing a somewhat rounded spot. Under side, with fringed spots, the twin trigonal spots corresponding with those on the upper surface, becoming yellow, and the 5 elongated patches belonging to the superior white group somewhat diluted with, and on the contrary, on the outer parts suffused with, a yellowish colour.

Thorax, tawny black; beneath on each side red.

Abdomen ashy white, with basal twin spots red; under side yellow; the ventral (or anal) spot, and 5 lateral (or side) spots black.

Hab. Islands of Aru.

In examining different specimens of this species we meet with many important deviations from the type, in both sexes; but first it will be best to specify those which are presented in the examples from which our plate is drawn.

♂ Primaries. The green of the upper surface is a very rich warm, inclining to golden. The posterior and exterior marginal green bands are absolutely continuous with each other, narrowest towards the base, broadest beyond the anal angle, and narrow again at its termination within 9 mm. of the terminal point of the costal band. The upper edges of these two bands (or sections of one band as they really are) are fairly straight; not so irregular or so sinuated as in other species (except *Pronomus*). The green atoms are often numerous and broadly placed along the under side of the median nervure, beginning at 9 or 10 mm. from the base, and extending the whole of the rest of the length; they are also broadly made to define the entire length of the 1st to its junction with the green band of the exterior margin, and likewise the 2nd and 3rd to where they enter the sericeous brown patch, also the 2nd discoidal nervure, and the submedian nervure a short distance along from the base, to be absent for an equal succeeding distance, again to follow the remaining

portion into the posterior margin. A few scattered green atoms are also seen along the upper part of the median nervure, and here and there in the black of the cell. The character of the warm green, the rich velvety black, and sericeous brown patch is very pure. The under sides have the green discocellular elongated patch, extending nearly the entire length of the cell. The lower part nearly straight with the median nervure at a short distance from it, beginning as a narrow stripe at the base, raggedly but equally widening till at its head near the discocellular nervure it is as broad as half the cell at that point; between 8 of the nervules, the greater portion of each space is occupied with the green markings, the first 6 from below being entirely solid or nearly solid green of a whitish golden tint, and the two upper or subcostal ones being partly solid and partly composed of sprinkled green atoms. The first 5 marks also each contain a black spot of variable form, not quite dividing them as in some specimens (and species), the 5th very small, the 3 below more or less lunate or ovate, the lowest nearly transverse over 2-3rds of the mark, and sharply bidentate.

Secondaries, a richer warm green, nearly golden, of great purity, or quite golden opposite the light—the green extending irregularly along the space within the costal and subcostal nervures, appearing almost like 3 patches of colour on the black, with a trace of the golden yellow spots in two of them—*i.e.* those beyond the anterior angle. The subcostal nervure and 1st nervule are black, and half of the median nervure extending from the base is of the same colour; black atoms and hairs are sprinkled thickly on the green within the cell to half its length from the base; 3 black spots, the lowest very rudimentary, and within the 1st and 2nd, nervules, and the discoidal and 1st median nervules; the 1st is oval oblong, the 2nd orbicular, and the 3rd only composed of a few black atoms or scales; outside of the first two are minute golden spots, the first only faintly seen on one wing. The black exterior margin is very narrow. The abdominal fold is a silky light brown, the long cilia or hairs silky brownish yellow. Under side, the green more golden, with greater intensity round the exterior margin, each division of which contains central specks or suffusions of golden yellow, with a slight indication of 2 golden streaks between the subcostal and costal nervures. The base, the subcostal nervure and nervule, the interior and outer margins, and the 6 submarginal spots are black as usual, and of very variable size; some green atoms form a streak above the costal nervure; and the space from the anal angle half-way up between the submedian nervure and 3rd median nervule is a rich golden yellow. Thorax with a green central ray nearly 3-5ths of its length. Abdomen very rich golden yellow: the lateral black spots very small; and triangulate anal mark black.

Length of costa 77, width of front wing 37, length of hind wing 42, width 32 mm. Length of antennæ and abdomen 33 mm.; of thorax with head 20 mm.

Length of legs { 1st Pair: femur 12; tibia 9; tarsi 15 mm.
2nd " " 13; " 13; " 17 "
3rd " " 11; " 14; " 18 "
This includes the trochanters.

Colour of the upper surface of wings when seen very obliquely against the light, entirely like a specimen of *P. Crasus* (see Pl. IX., figs. 1, 1a, 1b, 2).

Hab. Aru Islands. In the collection of Dr. F. Walker. Specimens in the Horniman, and in the author's museums do not very materially differ in any respect from the above.

♀. Colour of wings smoky brown, darkest at the base and in the upper discoidal cell to the white discal patch; much lighter *without* with the exception of a faintly seen curved marginal border. Lower wings much darker, smoky or tawny brown, lighter within the cell, over which and on the abdominal fold are long hairs of the same colour. All the spots and patches of each wing ashy-white. The discocellular patch on Primaries the whole breadth of the cell, very large, transverse, subquadrate, clouded on the inner, and 1-3rd divided by brown at the outer edges. The exterior marks, which are generally elongate, 8 in number, with the lower one separated by the brown, are here almost or quite obsolete within 2 sets of the veins, *viz.*, between the submedian nervure and 3rd median nervule, and 1st median and 2nd discoidal nervules, only 2 submarginal whitish dots being visible in the latter, a small semi-orbicular spot on the next above, 3 elongate spots within the subcostal nervules, the 3rd of them nearly divided in the middle by a rectangular spot; and 2 within the 1st, 2nd, and 3rd median nervules of only moderate length, and submarginal dot beyond.

Secondaries, with a small subcostal trigonate spot; part of an acuminate spot in the next subcostal space, with a submarginal trigonal larger spot, the 3 long acuminate marks which follow below being perfect, ashy-white, enclosing suboval brown spots, sinuated at nearest the exterior margin—the submarginal spots and portions being covered with ochreous brown, and the ashy-white above more or less impure near the nervule. The ashy-white patch on the interior margin also sordid.

Under sides of all the wings a lighter tawny brown than above, and a more clouded deeper brown in the darker parts. The ashy-white markings are purer and more silky, like the rest of the wings, nearly identical in shape and number with those on the upper sides; but the subcostal spots are pale yellow, the submarginal parts of the others being also more strongly suffused with the same.

Thorax same colour as darkest part of wings, with a pale green central ray above, very short, and the red of the sides beneath covering the whole space between the 2nd and 3rd pairs of legs to the base of the abdomen; but not appearing on the metathorax at all.

Abdomen, greenish ashy-grey, becoming ochreous at the last 2 and anal segments; the anal point ochreous brown. Subdorsal yellow to brown ochre, segments outlined strongly with dark brown: lateral dots dark brown. Eyes dark chesnut. Antennæ and legs, black.

Length of costa 100, width of upper wings 51, length of lower wing 66, width 42 mm.; of abdomen and antennæ 34; of thorax with head 22 mm.;

{ 1st Pair: femur 13; tibia 9; tarsi 12 mm.
of legs { 2nd " " 15; " 14; " 17 "
3rd " " 14; " 14; " 18 "

This includes the trochanters.

Hab. Aru Islands. In the coll. of Dr. F. Walker.

See Plate IX., figs. 4, 5. [The brown spot between the 2nd discoidal and 1st median nervules being asymmetrical for the 2 wings; the forms are given in figs. 5a, 5b, of the same plate.]

In a ♀ in the author's collection the superior cellular patch is nearly as if the upper half had been cut away in an oblique direction, only the faintest indication of it in white being left on the brown. The other white marks of the wing are all larger and more prominent, every neural space containing one or two.

Plate X., fig. 3, represents a var. of the ♀ in the British Museum, in which the discoidal patch is so large as to suggest that it might belong to *O. Cronius*. The best portion of the patch is creamy white subdued by grey atoms, the clouded part with grey atoms on a smoky brown. The submarginal parts of the patches of the inferior wings are suffused with a golden olive yellow; the intra-submedian space contains a black spot covered with grey scales; the central thoracic stripe is emerald green; the abdomen grey yellow, with an orange-lemmon beneath. Length of costa 100 mm.

Hab. Wokau, Aru Islands.

Fig. 1, Pl. X., is also of a ♀ in Brit. Mus. 5 mm. greater in costal length, with a sharply serrated subquadrate discocellular patch, and considerable variation in the other markings of the upper wing. Hab. Aru Islands. A much smaller ♀ in the same collection appears as fig. 2 in which the elongated marks outside the cell are very important and large, and in the space bounded by 1st and 2nd median nervules, in addition to the elongated irregular-edged mark, are two small submarginal spots, one within and nearest to the larger mark. These are all grey on a brown ground. The whites of the inferior wings are all ochreous grey; and this individual also suggests a close resemblance to *O. Cronius*. Its Habitat is the Aru Islands, but which of them is not indicated.

♂. In Brit. Mus. Green on median vein only faintly seen; 3 black spots on the under wings. The costal band of the Primaries seen against the light is a purple green, suggesting the colour of *P. Urvilliana*; the general green is bluish. Opposite the light, it is a warm yellow emerald, almost golden in the centre of the secondaries. On the under sides silvery bluish green; hind wings warm silvery green; markings nearly the same as those in our figure. The black of the costa is shot with a silvery purple gloss. Length of costa 78 mm. Hab. Wokau, Aru Island.

♂. In Brit. Museum. Greens, dark vegetable; against the light very dark olive, opposite light only emerald green with a slight warmth; salmon-coloured reflections even on the black. Spots of Secondaries 3; on the under side 6. In the cell of the upper wing on the under surface all but a broadish mark nearest the costa, 2-3rds of length green; colour of under sides against the light not a very warm yellow.

Pl. X., fig. 5. Green on upper side of the Primaries only on the median nervure, and slightly down the nervules. Length of costa 88 mm. Hab. Aru Island.

♂. Brit. Mus. A much warmer golden green; 4 spots on the lower wings, the lowest only faintly produced by atoms; on the under side 7 black spots, the 7th in ochreous yellow. (The under side very golden green.) Other markings, except in one respect like those of our fig. on Pl. IX. The same Habitat.

♂. In the Hewitson coll. With 2 spots only on the hind wings. The green is beautifully dusted with black atoms, growing denser at the base. This and another example are placed together as vars. *poseidon*, and *aruamus* of PRIAMUS—the latter from New Guinea, or Waigiou. Length of costa 77 mm. All the greens are very golden. The ♀ is of the ordinary type, with a costal length of 102 mm.

In the ♂ figured by Dr. Fickert in his paper (fig. 3, Pl. xx.), the discocellular green mark on the under surface of the anterior wing extends the entire length of the cell, all but a fraction, with a width generally more than half that of the cell; and the costal length of the wing is 83 mm.

It will not be difficult in another part of this work to show that *aruana*, *poseidon*, and *pronomus* are only local varieties of a *sub species* of PRIAMUS, and that, at any rate, the two former are identical in specific value.

Pl. 9, figs. 5, 6, represent varieties, one in the British Museum, and one in the author's collection. Pl. 9, figs. 3a, 3b, give the exact shape of the costal band and the sexual patch of a *variety* in the author's collection. Pl. 10, fig. 12, the shape of the abdominal fold of the ♀, and fig. 13 of the ♂ drawn flat, or only partially closed.

ORNITHOPTERA EUMÆUS.

Ornithoptera Eumæus, sp. nov. R. H. F. Rippon, *Annals and Mag. Nat. History*, August, 1892, p. 193.

♂. Wings silky green-blue (nearly peacock-blue), especially the primaries, in some lights a blue-green; narrowly bordered with black. Primaries on the upper surface with a broad, costal, longitudinal, discal band of nearly uniform width extending from the base to within a few millimetres of the apex, slightly narrower at each extremity, strongly divided from the base by the costal and subcostal nervures, and again nearly midway by the subcostal nervure and its first branch nearest the costal; this band broadens slightly and irregularly where it meets the first or upper discocellular nervule; the sexual transverse velvety patch extends from the first median nervule to midway of the space bounded by the median and subcostal nervures, is not separated from the green-blue by black, and is of a rich dark fuscous; the median nervure nearly to the base strongly accentuated by green-blue atoms, its three branches and the third or lower discocellular nervule being also dusted in the same manner, the atoms of the first median branch extending into the coloured border; all the remaining nervures and their branches are indicated faintly by these atoms; a green-blue marginal band extends from the base of the posterior to four fifths of the exterior margin, narrowest at the base and towards the anterior angle, where it becomes divided by the marginal folds into two or three elegantly curved patches, decreasing in size towards the outer angle, following the outline of the margin of the wing; all the remainder of the wing a deep velvety blue-black.

Underside a rich black, becoming very tawny black towards the exterior margin, the neurulation standing well in relief in either black or tawny black; within the discoidal cell an elongated patch of bluish green two thirds of its width near the discocellular nervules and very narrow at the base; a slight irregular margin of the same colour also at the upper part of the cell close upon the subcostal nervure; a few atoms also are so arranged as to suggest that the tendency was for the whole cell to be filled with green; without the cell the disk contains six green patches, widely separated by the nervules, and two costal patches, bounded by the third and fifth subcostal branches, the uppermost being the largest, and each of them being rather a congeries of more or less densely sprinkled atoms than a continuous patch of green; the first four of these, starting from the posterior portion of the wing, are divided nearest to the outer margin by a more or less subulate black spot; the fifth contains a triangulate, indented, and the sixth an elongate mark; all the green patches are well separated from the neurulation by black, and from the exterior margin of the wing by tawny black.

Secondaries: a silky green-blue extending over the wing till just within the second subcostal nervure, when the colour abruptly becomes a rich green, somewhat like that of *O. aruana* (Felder); this fills the remaining space of wing to the anterior margin, but is not found within the discoidal cell; the green and green-blue are delicately

dusted and gradated by black atoms outwards from the base and downwards; three black submarginal ovoid spots, the first within the first and second subcostal nervules twice the length of the third and less distinct, being dusted with green atoms; the outer margin of the wing narrowly black, the median and subcostal nervure and first subcostal branch black and well-defined in the green; the space within the precostal nervure to the base brown-black. Underside rich golden-green, as in *aruana*; the space from the anal angle within the submedian nervure and third median nervule halfway up golden-yellow, base black; six large submarginal black spots, the upper one quadrate, the others more or less suboval; anterior margin partly filled with green, and space on each side of precostal nervure with green atoms; exterior black margin slightly broader than on the upperside, indented inwardly within the first and second subcostal and second subcostal and discoidal branches; the subcostal nervure and its first branch well defined by black.

Head.—Eyes pearly light brown, margined with white; space between deep black; antennæ light smoky brown. Articulations of antennæ 54 each.

Thorax.—Velvety black, with a very obtrusive longitudinal green-blue stripe; beneath lateral red patches and tawny black. Legs black.

Abdomen.—Golden yellow and ferruginous brown, the latter perhaps intensified by fading; anal segment with the usual trisinate black mark and a minute tawny curved spot on each valve divested of scales; lateral black dots six in number.

Length of costa 80 millim.; antennæ and abdomen each 33 millim.; head and thorax about 20 or 22 millim.

Hab. Aru Islands.

On the underside this form does not present any features sufficiently distinct to distinguish it from *aruana*; the upper surfaces, however, are remarkably different in colour from that species, though the arrangement of the markings is nearly the same. The rich golden-green of *aruana* is replaced in this species by the brilliant green-blue, and the singular patch of vegetable- or *aruana*-green on the posterior wing, as described above. By contrast with the green-blue this colour seems most like that of *pegasus* (Felder), while the gradations of colour and opalescent tints in certain lights link it with *Urvilliana* and *cræsus* on the one hand and *priamus* and *pronomus* on the other. Possibly it is only a remarkable transitional variety of *aruana*, but at present it is sufficiently distinct to merit a distinguishing name; and it goes far towards enabling us to link together the whole of the members of the *Priamus*-group and regard them as local forms of the typical species *priamus*.

A comparison with the greener varieties of *urvilliana* gives a very close resemblance between the colours of the costal longitudinal bands of *eumæus* and *urvilliana*, if placed side by side in the same light. The silvery opalescent sheen of the two species, viewed obliquely, is also very similar. In the order of colour transition we should have the following arrangement: *pegasus*, *aruana*, *eumæus*, *urvilliana* (greener-blue form), *urvilliana* (purple-blue and violet forms), *cræsus*, and *lydius*. Probably the *aruana* form, considered biologically, is the oldest in time; but this is a question to be considered by Prof. Weismann. Of course this arrangement appears to dethrone *Priamus* from its position as the type species of the group; but this result would often follow, if we only knew the life-history of many other families and genera of insects. It may be useful in this place to record the following results, when the species named above are viewed from a table placed opposite the light. If *eumæus* and the greener form of *urvilliana* are seen side by side, the costal discal band of *eumæus* will be exactly the colour of that of *urvilliana* viewed in the normal position and light, but the colour of the remainder of the hind wings will be identical with that of *pegasus*; the hind wings of *urvilliana* will, however, have changed very little. In the same position and light all the wings of the violet form of *urvilliana* will be of a uniform sordid silver grey; of *pegasus* the upper wings will be a deep copper red, and the lower a coppery black green; of *lydius* a light orange and very warm olive green; of *cræsus* an uniform orange green; of *aruana*, the costal band a warm copper, the rest of the wings a green approaching that of *pegasus*, with a suffusion of the copper tint. The black areas of each species are generally shot with either silvery or coppery sheen. Of the other forms such as *Priamus* and its allies I will speak in another section of this work.

♀. Wings on both surfaces tawny brown, richer on the underside. Primaries with a subquadrate oblique patch within the discoidal cell sordid white, the *pseudoneura* quite visible; without the cell are eight elongate separated marks of the same colour, the first within the third and fourth subcostal branches ill-defined in outline, short and acuminate, the second shorter and broader, the third a long hastate mark filling one half the space between the nervules and containing a cuneiform spot; the fourth is shorter, with a larger cuneiform spot; the fifth consists of three white spots of different forms, widely separated by the brown; the sixth is divided into two of unequal size; the seventh is divided into a long hastate and an irregular-shaped small mark; the eighth is twin-spotted, with a faint spot higher up; the exterior margin with small whitish scalloped spots. The sordid colour is caused by the white being all covered with grey scales. Secondaries with the submarginal band white and very broad, occupying the greater part of the disk between the

nervules; four divisions,—or those bounded by the second subcostal and the third median branches,—containing midway a moderately-sized orbicular tawny-brown spot, the upper one being the largest; each of these divisions is sinuate at the outer end, the indentations being most numerous in the upper two, and all are pointed or acuminate at the ends nearest the cell. Between the first and second subcostal nervules is a separated sinuate spot or a portion of the white band cut off by the brown of the wing; below the black orbicular spots the white becomes more tawny, and between each of the divisions are indications in ochre of the trigonal yellow marks of the underside; the lunations of the outer margin tawny yellow-white.

The undersides of the primaries differ little from the upper; the same may be said for the secondaries, except that between the costal nervure and the first subcostal branch is a small dark yellow irregular-shaped spot; a small orbicular black spot in the white between the submedian nervure and the third median branch, and the white beneath all the black orbicular spots contains a yellow acuminate mark filling most of the space from the spot to the sinuate border, the lunations of the exterior margin being also yellow; neuration well defined above the black.

Head.—Eyes dark brown, margined with tawny white; antennæ dark brown; articulations 54 each.

Thorax.—Above tawny brown, with a narrow green-ochreous longitudinal stripe; beneath, lateral crimson-scarlet spots occupying much of the space above and on each side of the legs, the remainder tawny brown.

Abdomen.—Above greenish-ochreous white; subdorsal brownish ochreous-yellow, with strong black articulations and five lateral black dots.

Length of costa 102 millim.; antennæ and abdomen each 37 millim.; head and thorax 25 millim.; measurement of the legs cannot be given, as they are imperfectly represented in the specimens from which the species is described.

From the foregoing it would appear that the pattern is of the same type and well within the limits of the variations in the species *aruana*; and this insect might easily be taken as a female var. of that species. In the case of the male it would be impossible to make a mistake.

Hab. Aru Islands.

I am indebted to the Hon. L. Walter Rothschild for the pleasure of describing and figuring this beautiful new species, from his superb collection.

Genus ORNITHOPTERA, BOISDUVAL.

Section PRIAMOPTERA, Rippon.

The general characters of this section in the ♂ differ little, if at all, from those of the other ORNITHOPTERA. In colour however we have a striking change, which renders them very prominent even among the members of so splendid a genus. This difference extends to every part of the insect. The silky black is nearly the most intense black to be found in nature.* The abdomen is more intensely lemon yellow, or orange lemon, than in the green forms; indeed they have a brilliancy of colour that is perfectly indescribable, whether by the pen or brush. The abdominal fringe is always very prominent, and looks remarkably like the fur of some vertebrates, or even the lighter varieties of human hair. The colour surfaces of the wings above are either purple, violet, blue or blue and violet, or greenish violet, orange chrome or lemon, or golden orange, and copper tints; indeed there is every possible gradation to be met with in the examination of a large number of examples of the 3 species at present described. *Urvilliana* belongs to the purple—*lydius* and *cræsus* to the orange, series. *O. eumæus* evidently takes the place of a transition species from ORNITHOPTERA to PRIAMOPTERA, thereby linking the two together by means of itself and *aruana*. On the under surfaces, while the general pattern is always similar to that of Ornithoptera, the warm golden greens are replaced by much blue or purple blue on all the wings in the vars. of *urvilliana*: in *lydius* and *cræsus* by a more orange green, or orange without the green tinge. A peculiar feature also in *lydius* is the large surface of pure orange or lemon

yellow on the upper parts of the hind wings in *lydius*, and is a lesser degree in *cræsus*. These are the same on both surfaces, are not diluted by other coloured scales of black, orange, or copper, and are almost semi-transparent. Minute spots or dots of a similar character and texture are found on nearly all the species of Ornithoptera, but sparingly and unobtrusively; in PRIAMOPTERA they attain their maximum. The thoracic longitudinal stripe in *lydius* is quite of a metallic appearance.

The ♀♀ of the purple species *urvilliana*, though they vary much in marking, are all remarkably light in colour—the smoky brown often causing them to look as if they were faded; but with the one exception at present known they have a general resemblance to the ♀♀ of other species. That exception is in *lydius*, where a sordid white on the primaries and sordid yellow on the secondaries occupy most of the area of the wings, and gives the appearance of a huge *acreoid* or *danaoid* insect. This arrangement is the same on the under surfaces. The form of the upper wings differs also considerably from that of its congeners. Such an abnormal character suggests to us the possibility of *lydius* being a Dimorphic species, probably with another ♀ of the ordinary type of pattern, and if so it might ultimately be found that *cræsus* is favoured in the same way. The abdominal fringe is always shorter, and an abundance of long hairy scales is always found on the upper parts of the hind wings, as in ORNITHOPTERA proper.

The type of this section is *O. lydius*, Felder, a description of which will be found on the next page.

*The most intense and absolute black (that is a black that seems to absorb all the rays of light) is found on the blossom of the papilionaceous flower of the broad bean, *Faber vulgaris*, Lindley; one of the edible *leguminosa*. The white of the same flower is also the purest to be found in nature.

O. (PRIAMOPTERA) CRÆSUS.

Ornithoptera Cræsus, Wallace, Proc. Ent. Soc. Ser. II. vol. V. p. 70 (1859).

O. Cræsus, Gray, Proc. Zool. Soc. (1859), p. 424, t. 68, 69.

———, Feld. Wien. Ent. Mon. III. p. 390, n. 31. t. 6 f. I. (1859).

O. Cræsus, local form, *a.* Wall. Trans. Linn. Soc. XXV. p. 37. n. 3. (1865).

O. Priamus, var. *m. Cræsus*, Kirby, Syn. Cat. Diurn. Lepid. p. 518 (1871).

O. Priamus, var. *Cræsus*, ♂ Staudinger und Schatz, Exotische Schmetterlinge, Band 1. t. 1. f. 3. Band 2. p. 3. (1888).

O. Cræsus, Oberthür, Etudes d'Entom. (Cat. Raissone de Papilionidæ de la Coll. de Ch. Oberthür,) p. 30.

O. Priamus, var. *Cræsus*, Dr. C. Fickert, Ueber die Zeichnungsverhältnisse der Gattung *Ornithoptera* (Zoologisch, Jäbuchern.) p. 709. (1889).

This glorious species was taken by Mr. A. R. Wallace, in the forests of Batchian, early in the year 1859. His description of its discovery and capture (*Malay Archipelago*, Vol. II. pp. 50-51) is most interesting. He tells us that during his very first walk into the forest he saw, sitting on a leaf out of reach, a specimen of this insect. It was the ♀. He was at once anxious to secure it, and find its ♂ which was sure to be of great beauty. Two months passed by, during which he only saw it once again, and soon after the ♂, flying high in the air at the mining village. One day about the beginning of January he saw one hovering over a species of *Mussaenda* (a shrub with large white leafy bracts and yellow flowers). On the two following days he succeeded in capturing first a ♀, and then a ♂. On taking the ♂ from the net, he nearly fainted with excitement and pleasure—so great was its beauty. For some time after that he obtained (on clearing the space round this shrub) an average of one specimen a day—more than half being ♀ ♀; and more than half of the remainder in very bad condition. In a better locality he obtained more than a hundred of both sexes, including about 20 very fine males, though only 5 or 6 were absolutely perfect. His native collector caught these chiefly in the bed of a large rocky stream descending from the mountains to the sea, about a mile below the village.

Since then, of course, a fair number of specimens have been brought to Europe from other localities—some of them bred (of which more later on).

The name *Cræsus* was proposed by its discoverer in his letter Jan. 28th, 1859, published in the Proc. Ent. Soc. for that year; but was little more than a *MS* name till in the same year Gray described the ♂ and gave figs. of the two sexes, at the same time adopting Mr. Wallace's nomenclature, with the intimation that otherwise he would have dedicated it to its discover. In the same year also Felder gave Latin descriptions of the ♂ and ♀ in the *Wiener Entomologische Monatschrift (Lepidopterologische Fragmente*, pp. 23-24) with a colored plate of the ♂. At the time of its discovery and till more was known of it, Professor Westwood thought that the ♂ was perhaps that of *Tithonus* (of De Haan) figured by the latter in the

first plate of his "Insects of the Dutch Settlements," the unique specimen of which was in the Leyden Museum; and that the ♀ would prove to be the *O. Victoria* of G. R. Gray, figured in the Proc. Linn. Soc., from a specimen in the Brit. Museum, and taken in one of the islands of E. Archipelago. But the publication of descriptions and figures soon proved conclusively that a new and wonderful variety of the *priamus* group had been revealed. It may be here remarked that the ♂ of Felder's *Pegasus* is shot intensely with the *Cræsus* reflections, though in every other respect it differs; and that the ♀ of *pegasus* on the upper side bears a resemblance to the ♀ of *Cræsus*.

From Gray's and Felder's descriptions I venture to compile, with additional remarks, what, I trust, will fully portray the superficial characters of this species.

"♂. Primaries deep black, with the anterior band widening towards the middle, and of a golden orange colour, this colour also represented by an abbreviated band at base of inner margin, and by a few scattered specks on inner and outer margins." [The black colour is a warm sepia graduating from the outer margin to a deep velvety black at the base.] "Secondaries of a dull orange colour, with some spots of King's yellow; this difference of colour is occasioned by the semi-transparency of the more decided spots of the under surface of the wings when the insect is held against the light; the base, subcostal, and median nervures, first subcostal nervures, and the narrow edge of the outer margin are deep black. A black spot is sometimes found between the 2nd and 1st discoidal nervures. Underside of primaries most like that of *O. Richmondia* in form of markings, but they are of a rich golden green. Underside of secondaries also closely approaches that of *O. Richmondia*, but it is of golden green, with a lengthened spot of rich King's yellow above the black spot between the costal nervure and the first nervule, and a small spot below the black spot; the same kind of yellow spot above and below the black spot in each space between the 1st and 2nd nervules and the 2nd and 1st discoidal nervules; the next two black spots with a yellow spot beneath each; in the discoidal cell is

placed a lengthened spot of King's yellow. The anal angle King's yellow, without any black spot such as is found in the other species, the base, nervures, and narrow margin, deep black." [These semi-transparent yellow spots, which render the insect so remarkable, are occasionally to be found on the lower wings of *Richmondia*, and even near the costa of lower wings of *Priamus*; possibly also in *pronomus* (under-side); and slightly indicated in *Aruana*. I shall refer to them again in section 7 of this work.] "Thorax black and hairy; above greenish in the centre, beneath with a lateral red spot." [The green mark in the middle of upper side of thorax is of a rich shining metallic green resembling the colour found on the elytræ of a gorgeous species of beetle belonging to the Rhynchoporous genus *cyphus*, and extends to nearly 3-4ths of the length of the thorax, the upper part occupying nearly the entire space between the tegulæ. Its greatest width is a third of that of the thorax.] "Abdomen yellow, with diffused lateral black spots." [These spots are nearly subdorsal].

The differences between the ♂ of this species and of *Priamus*, which are noted by Gray, will also be referred to in section 7 of this work.

♀. Wings on both sides obscure fuscus. Fringe spots coarsely white. Front wings with 2 anterior minute spots in the cell (under the striga somewhat longitudinal) with 2 others (above elongate) and 6 others exterior unequal (in shape). These are ashy-white, broadly interrupted; below more distinct and spreading. Hind wings above with an anal dirty yellow spot, and 4 other exterior spots pointed, triangular, and curved inward (sinuate); within, ashy white, outside with 5 apical of the same colour, and 6 costal, yellowish, adjoining each other. Undersides with the spots more distinct in colour, yellow without, whitish within. The anal with an asy lunule. Internal margin joined. Thorax, above reddish black; spot above, yellowish. Below, sides entirely red (*rufo*) hairy; abdomen yellowish, blackish at the base; above, the back ashy, below, with 5 lateral dots; spots black in the middle, and other two basal spots red.

The type ♀ therefore differs in several particulars from the specimen from which my fig. was drawn, but, as might have been anticipated, not so much in the ♂. The central longitudinal mark on the thorax of ♀ is a brilliant green (but not quite so intense as in the ♂—the yellow somewhat prevailing over the green. The acuminate patches between the nervules of lower wings are a reddish yellow (slightly suggesting the tints of the ♂, the upper parts of these of a sordid reddish yellow, instead of ashy sordid white. The anal patches are also of the same colour, as are the lunules of the outer margin between the dentations. Only one ashy white spot is found in the discoidal cell of upper wings, nearest to the 2nd branch of the median vein. The ashy spots are rather more prominent; the abdomen is yellower, with brownish cloudings above; the underside of front wings with markings almost identical in shape, size, and colour. The under surface of hind wings more like that of the type; the anal lunule being yellowish instead of ashy.

The vermilion on sides of thorax covers almost the whole surface to the trochanters, and the abdomen ranges from brownish red to greenish yellow. A second ♀ in the Rev. Dr. F. A. Walker's coll. is rather darker, with

smaller spots on the upper wings, but 2 or 3 spots within the discoidal cell, that is to say it approaches the type more nearly in character. A ♀ in the Brit. Mus. has the upper portion of the yellow on the secondaries brighter than in the type, while the general colour of the wings is also paler.

In a ♂ in the Brit. Mus. the orange band of Primaries is of a deeper red than in that of the fig. In two others in the Hewitson collection, the orange is yellower, and the underwings more opalescent, ranging from yellow orange to green; the King's-yellow semi-diaphanous spots of secondaries are only 2 in one specimen, and 5 in the other, with an acuminate trigonal sinuate mark above the round black spot below the discocellular nerve—there being 3 others of the latter spots; the black hind marginal borders are much narrower on the under wing. The median nerves are very black in one specimen; the semi-diaphanous spots absent from lower wings round the hind margin, replaced by one largish black spot (flanked by 2 nearly obsolete black dots) nearest the costa. The black of Primaries is really a very black orange brown. The orange is deeper than in the type, and the black appears to be shot with velvety purple in certain lights. The dimensions of this latter specimen are: costa 86; abdomen and antennæ 36; breadth of upper wing 44; length of lower wing 34, and greatest breadth of orange subcostal band 17 millimetres. Hab. Ternate.

♂. In Mr. Oliver Janson's coll. much more lemon yellow in sub-costal band than in Wallace's specimen's; the semi-diaphanous spots on lower wings are the same in number but paler, and more like the ground colour, and the yellow mark within the cell is longer than in that of the figure. This is a bred specimen from Batchian. It seems that specimens which have been bred from larvæ conveyed to Java and Amboyna become much lighter than those taken on the wing by Wallace. Probably the slight change of the food plant and geographical environment may account for this. It is an interesting fact, to which it may be necessary again to refer in some other place.

♂. In Hewitson coll. *very red*; the green reflections not so intense as in other examples; the under wings very deep copper red; subcostal band much broader and more excavated from lower part nearest the anterior angle; the 4th subcostal nervule not black, while in the first specimen of his series it almost becomes a black band of atoms, much denser towards the middle; on hind wings only 3 semi-diaphanous spots, *i.e.* within the cell, on the costa, and between 2nd and 3rd subcostal nervules. On the under surface these form a continuous patch, only divided by the nervules (or veinlets as they would be most properly called); on the under surface of superior wing the green band extends over the lower half of the cell, with a distinct trace at the edge of the upper half. [Wallace's type has only a small blotch slightly suggestive of the shape of a terebratulid shell of the Brachyopodous Mollusca]. Hab. probably Batchian.

♂. Contrast with the above a var. in Mr. Walter Dannatt's collection. Colour of subcostal band lemon orange; of hind wings the same. Lower half of posterior margin of Primaries with a broadish set of spots nearly forming a band, composed of lemon-orange atoms situated within the 2nd discoidal, and the 1st, 2nd, and 3rd median

nervules (and divided by them), and extending to the submedian, becoming fewer and more scattered, and directed nearer towards the sexual velvet patch; a few scales also above the 2nd discoidal nervule; the lemon orange band broadest at the deepest part of discoidal cell (9 mm); the whole discocellular portion of band somewhat resembling the pine pattern of an Indian shawl; the base is also broader without the cell (10 mm.); much more (and more uniformly) executed or rather scalloped, and broader at its termination near the anterior angle. Behind the band at broadest and outside the cell is a small group of lemon orange atoms; parallel with the submedian nervule is a line of atoms; and the orange band within the interior margin is broader than that in the plate, the internal nervules strongly dividing it half way; the semi-diaph. spots on the secondaries within disco. cell and below costal and sub-costal nervure larger and more definite in form than in the plate; the spot between first and second subcostal nervules nearly fills the white space and is sinuate. Between the discoidal and first median and first and second median nervules, no spots; a small black spot between second subcostal and discoidal nervules; on the left wing is a trace of the second black dot nearly as large between discoidal and median nervules; but not on the right wing. On the upper wing the band from first disco-cellular nervule becomes more green till it reaches the anterior angle; the border of black on anterior margin also broader at midway from same point towards the apex. Abdomen rich lemon with lateral greenish shades, and brownish dark cloudy streaks in the centre between each segment. The black of wings very deep, undersides differ little from the fig., except that the colour of the green is more golden, and an extra atomic spot occurs between the third and fourth subcostal nervules, and a marginal spot of green atoms, the latter large and triangulate. Length of costa, 84; of hind wing, 41; and of abdomen and antennæ, 34 mm.; Hab. ? Received from Dr. Staudinger; and probably bred in Amboyna.

♂. In the one described by Dr. Fickert he points out an asymmetrical difference in the number of spots of the hind wings—the discal black spots on right wing being seven; and six on the left. We shall see later on that both ♂ ♂ and ♀ ♀ of most of the species are occasionally asymmetrical, and of course this feature occurs throughout nearly the whole of the diurnal lepidoptera more often than might be supposed, without close examination.

♂. In the museum of Messrs. Godman and Salvin is a var. of extraordinary beauty and interest collected in Batchian by Dr. Plater (colored figs. of which will be found in the 2nd plate devoted to this species), in which the brilliant lemon orange is so intensely shot with a warm green identical with that found on the ♂ of *O. (Ætheoptera) Tithonus* of de Haan, so much so that when viewed obliquely against the light the whole of the yellow except the golden marks of the lower wings, is a rich warm green, being most intense on the sub-costal band, and causing it to be a more gloriously green insect than *O. Aruana*. It is remarkable that the yellow of *tithonus* is shot in the same way, though not with quite the same intensity. Viewed opposite the light the orange is incomparably fiery in its tone; the median nervure is broadly black with atoms; the thoracic longitudinal stripe is bluish metallic green. On the under surfaces, the green is of the same character as above; but the markings are smaller and more elegant, as may be seen by reference to the figures in the plate.

See the same plate for variations of the ♀ in this collection.

MEASUREMENTS.

♂. In Mr. Horniman's coll.; (original of my fig.) length of costa 85; of lower wing 48; of antennæ and abdomen 35; of thorax 16; of collar 8; and of head 4 mm. Width of upper wing 43; of lower wing 36; of abdomen 5; of thorax 11; of collar 6; and of head 9 mm.

♂. Felder's fig., length of costa 83; hind wing 42 or 43; antennæ 35 mm. (the abdomen is drawn too long). Breadth of upper wings about 41; lower wings about 36 mm.

♂. Type in Brit. Mus.: length of costa 85; antennæ and abdomen 32; thorax (including collar and head 26; width of lower wings 31 mm.

♀. Type in Brit. Museum; length of costa 95; antennæ and abdomen 34; thorax with head 24; width of abdomen 11 mm.

♀. In Hewitson coll.: length of costa 96; underwing 63; width of upper wings 48; of lower wings 41 mm.

♀. Dr. Fickert describes the expanse of wings in his specimen as 185 mm. [That doubtless includes the width of thorax.] Hab. Batchian.

♀. In collection of Dr. Francis A. Walker, the original of my figs.; length of costa 108; hind wings 71; abdomen and antennæ 35; thorax 18; collar 3; head 3; width of upper wings 55; lower wings 46; abdomen at widest 17; thorax 13; head 10; and collar 8 mm.

♂	Figs. on Plate.	Length of legs—			
1st pair; femur	12,	tibia	10,	tarsi	16 mm.
2nd "	"	11,	"	13,	" 19 "
3rd "	"	10,	"	15,	" 21 "

♀.	Figs. on Plate.	Length of legs—			
1st pair; femur	14,	tibia	12,	tarsi	14 mm.
2nd "	"	13,	"	13,	" 17 "
3rd "	"	14,	"	15,	" 20 "

These do not include the trochanters or coxæ which average a little over a millimetre each.

No. of joints of the antennæ of both sexes from 58 to 64.

The cilia from the abdominal fold are so long in the ♂ that when the body is set below the interior margin, they meet across the widest part.

I am indebted to the kindness of Mr. F. J. Horniman, F.R.G.S., &c., for the opportunity of drawing the two figs. of the ♂ of this species from a fine specimen in his wonderful museum; and I take this opportunity of strongly commending the liberality with which he renders his treasures of use to the general public. I hope the time will come when multitudes of private local museums will be made by their owners a source of instruction and delight to the people, as well as to the specialist. Mr. Horniman most worthily pioneers such a movement, which I am sure there is a growing disposition amongst many others to join in. I may be pardoned for saying so much, as the need of such a public benefit has been on my mind for many years.

I am also under great obligation to Dr. A. Francis Walker, F.Z.S., &c., for the privilege making one of his two examples of the ♀ of this beautiful species the subject of my figs. He will please to accept my thanks for his kindness in the loan of the specimen, and for the knowledge gained by an examination of the four examples of the ♂ in his very fine museum.

Also to Messrs. Goodman and Salvin for liberal access to their noble collection of diurnal Lepidoptera.

Mr. Wallace, in Trans. Linn. Society, vol. xxv. p. 37, briefly describes a local form "a" of the ♂ from Ternate, which is probably the same as I have described above from Hewitson's coll.; also of a ♀ from Gilolo or *Djilolo* in which "the white markings on all the wings are so large as almost to fill up all the spaces between the veins, the lower part of the discoidal cell in both upper and under wings being occupied with a whitish patch;" and he

adds "this well marked local form is no doubt peculiar to Gilolo and the small adjacent islands, as the original is to Batchian." The ♂ is undoubtedly a transitional form between *Cræsus* and Felder's *Lydius*; but it may be possible to show hereafter that the ♀ belongs to some distinct species.

As such a remarkable difference obtains between the numerous specimens of this species now in our collections, as regards the depth and intensity of the orange colour of the ♂ ♂, i.e. from the lightest yellow with a red tint, to the deep orange of Hewitson's specimens, it is not improbable that ultimately, as we obtain more material from the localities of this and the following species, we shall have to consider them as only meriting the single name of *Cræsus*. At present, as will be seen in the next article, the ♀ of *Lydius* is so abnormal in appearance as to considerably stand in the way, at least till the species is found to be dimorphic.

O. (PRIAMOPTERA) LYDIUS.

Papilio Lydius, Felder Reise, Nov. Lep. I. p. 9. n. 5. t. 3 a, b. 1865 *

* [Date of the 2 figs. in this work, 1864.]

Ornithoptera Priamus, var. *lydius*, Fickert, Ueber die Zeichnungsverhältnisse der Gatt. Ornith. p. 711. taff. xx, f. 5. ♀ (the fig. is reduced, and uncoloured.)

O. Lydius, Oberthür, Etudes d'Entom. [Cat. Raisonné de Papilionidae de la Coll. de Ch. Oberthür.] p. 30.

Papilio Priamus, v. *Lydius*, W. F. Kirby Syn. Cat. of Diurnal Lepidoptera p. 518. 1871.

O. Priamus, var. *Lydius*, Staudinger und Schatz, Exotische Schmetterlinge, Band 2, p. 4 (1888).

When Mr. Wallace discovered *P. Cræsus* it might well have been thought that the *ne plus ultra* of splendour in the forms of the *Ornithoptera* had been at last reached. An insect that must have flashed in the sunshine like a living flame at one moment and a brilliant emerald at another, could not expect to be surpassed in glory of colour! But Nature has always surprises in store for her lovers, however much they may think they know of her. In other words we may always be certain that however wonderful may be the revelations of the Creator's mind, there are ever greater held in store for us! All we have to do is to be ready to receive them, and reverently and gratefully to adore the revealer.

The species now claiming our attention is remarkable for the fact that its splendour is more intense and wonderful, the amount of contrast between the glowing orange and the sunny lemon is greater, and the colour interference is more developed in the male than in the corresponding sex of *Cræsus*; while the female is quite

unlike any other ♀ of the *Priamus* group, so much so that below we shall have to suggest a special explanation of the phenomenon. We may readily differ in our opinion as to whether *Lydius* is a var. of *Cræsus*, or the reverse. One thing is certain, that they are very closely allied: being only local forms derived from some common ancestor, the ♀ of the present species having been considerably modified in pattern to meet some necessity of its environment.

As the original description of this species by Felder is in Latin, and I have, through the generosity of the Hon. W. Rothschild, the privilege of re-figuring *Lydius* from Felder's types, I thought it would be more useful to redescribe the species, for the benefit of English students who might not wish to wade through a long and masterly description in Latin and German. This must be my apology for going over ground that has already been trodden by so able and profound an Entomologist as Herr Rudolf Felder.

♂. Upper wings arched and somewhat acute at the angle. Lower wings somewhat abbreviated, the apical angle slightly projecting. Upper wings with only the slightest indication of white lunules*; velvety black, diluted with fuscus, more especially towards the margin, where it graduates into a very perceptible red-brown; the subcostal longitudinal band fiery red (deep glowing orange) shot with golden green, when seen obliquely against the light. Opposite the light the scarlet orange is intensely brilliant. This band is unusually broad, as in *Cræsus*, commences within the discoidal cell at a short distance from the base, where it is at its narrowest, then broadening till it is more than 2-3rds the width of the cell; from thence it extends outside the cell nearly to the apex of the wing. Within this area are included a part of the 1st and 2nd subcostal branches, as a thin line of colour, between the 2nd and 3rd the colour extends 16 mm. towards the apex, between the 3rd and 4th to within 4 mm. of the apex, between the 4th and 5th, decreasing in length posteriorly, and between the 5th and 1st discoidal nervule a still shorter, irregular tetragon, the lower edges of the divisions terminating with fiery atoms, forming within the 1st and 2nd discoidal nervules a small spot of atoms; as the black runs in prominently at the first discocellular nervule wedge-shaped, and is generally irregular in its impingement on the red band along its whole outer length, it gives the edge of the band an irregularly ragged appearance, though above it follows the curve of the costa accurately. The sexual sericeous patch or brand is pupæform, and light fuscus—the head towards the base, and the tail curved up in the direction of the apex of the wing and extends from the submedian nervure to nearly the 1st median branch, running counterminous with the median nervure at nearly midway between it and the outer and interior margins; a small patch of fiery orange and lemon at the base on the interior margin is partly divided by the branch of the submedian nervure, and is longer, formed by atoms of colour.

Posterior wing fiery orange, subdued by scattered black atoms; within the discoidal cell a subtriangulate patch of golden yellow, immaculate, occupying 3-5ths of the cell, and not quite close to the nervures; a smaller patch between the costal and subcostal nervures; a hastate patch between the 1st and 2nd subcostal branches, the 3 forming a large almost homogeneous patch, divided by the subcostal vein and its branches—the veins being black edged with the fiery orange; between the costal nervure and its top branch following the golden patch is a cuneiform black spot pointing outwards, followed by a golden yellow sublunate spot; between the 1st and 2nd subcostal branches is an orbicular black spot just below the hastate golden patch, followed by a sublunate gold spot; also a suborbicular or ovate black spot between the 2nd subcostal branch and the discoidal nervure; and a faint atomic spot between that and the 1st median branch; exterior marginal border black, irregularly curved with golden atoms at their inner edge; interior margin and anal angle black; abdominal fold brown black, its underside a light lucent brown, fringed with very long brownish ochreous hairs; the median

nervure well expressed in black with golden orange atoms all the branches being sufficiently distinct.

Underside: Primaries black brown, more golden fulvus towards the exterior margin; a green patch extends along the whole length of the discoidal cell, and only narrowly separated from the median nervure and 3rd discocellular nervule by black, the subcostal or upper side of this patch is irregular in outline, at the base broad and uniting with a thin streak of green atoms which extends 1-3rd along the costal nervure; it is then straight and increases in breadth to beyond the middle of the cell, when it abruptly rises, proceeds on in equal though increased breadth about 6 mm., to be again depressed a short distance, finally rising to a point at 3 mms. from the 2nd discocellular nervule, and irregularly curving down to the lower margin of the patch near the 3rd; this patch is golden green from the base, becoming bluish green as it nears the discocellular nervules, and contains an elongate golden spot within its upper edge nearly midway of its length; between the 3rd and 4th subcostal nervules are 2 rather long patches of green and bluish green, the inner one nearer to the costal nervure tetragonal, the outer one rather longer and hastate in form; a punctiform spot between the 4th and 5th subcostal nervules nearest to the base of these veins, with a slight indication in green blue atoms of a longitudinal streak near the outer margin; between the 5th subcostal branch and the 1st discoidal nervule commences a broad band of blue and golden green extending down the wing to the submedian nervure, but more or less separated by black on each side of the nervules, and also from the discocellular nervules and the median branch, being thus divided into 11 patches of varying size and form, the inter marginal black border being nearly equal in width from the anal to the anterior angles, and from 3 to 5 mms. in breadth; the 1st of these between the 5th subcostal and 1st discoidal nervules occupies the whole width to within a short distance of the 1st discocellular nervule, and is interrupted beneath by a long irregular oblique spot of black; between the 1st and 2nd discoidal branches, the green is as broad as the enclosed space, and is divided almost midway by a large hastate black patch; between the 2nd discoidal and the 1st median nervules the green is also nearly equal in breadth with the enclosed space, separated by a rather less broad lunate black patch, the lower division of the green containing a black indentation from the dark patch; between the 1st and 2nd median branches the green is so much more separated from the nervules and nervure by the black, and so definitely divided into two parts, the inner one nearly three times as large as the outer, as to become independent patches or spots—the inner being rectangular, slightly curved at the apex, the outer subquadrate, but slightly curved at the apex; between the 2nd and 3rd median nervules the inner green patch is separated still more by black from the veins, is irregularly rectangular, slightly crescentic at its base, and divided broadly from the lower patch which is subquadrate; between the 3rd median nervule and sub-median nervure the greater portion of the space is occupied by the golden green, divided nearest to the outer margin by black, the lower part of the largest division being sharply dentated, the upper part of the smallest also dentated, so that the black between takes a zigzag form—a few scattered green atoms uniting the two divisions of the green at the point nearest the sub-median branch; a long brown line runs from the base of the interno-median nervule 2-3rds through the larger division of the green patch terminating in an elongated club-shaped spot at about 3-4ths of its

* In closely examining the fringe of the wings with a lens, I find that the under sides of the type have been cleverly patched (the specimen, when captured, was evidently not in its pristine perfection) and the edges of the wings have apparently been slightly trimmed with a scissors, thereby destroying the slight lunulations, and making the margin quite straight. But there is a faint indication of white in those places where the lunules would be; and, as a matter of fact, they are to be found slightly represented in the margin of every perfect specimen of any species of *Ornithoptera*, as far as I have been able to judge.

extent; the posterior margin is black from the anal angle to the base.

Posterior wing diluted golden green, outer portion with a waved fuscus black border, narrow, but narrowest towards the anal angle; between the costal nervure and 1st sub-costal, and 1st and 2nd, and the greater part of the discoidal cell, with a small spot outside the 2nd discocellular nervule, a brassy or golden yellow; a narrow margin of green follows the golden area in the cell, this again is separated from the median and discoidal nervures to the 3rd median branch at their junction with the median nervure, by black; the space bounded by the remaining nervures and nervules are golden green in the first four, and golden green and golden yellow in the last—or within the 3rd median nervule and submedian nervure; the whole of the intervenal spaces also contain fuscus black spots and marks in the following order:—A large subulate spot between the costal nervure and 1st subcostal, followed by a crescentic golden spot, surrounded by green towards the outer margin, a large subcuneate black spot followed by a narrow subcrescentic golden spot, surrounded by golden green between the 1st and 2nd subcostal nervules, a smaller decrescentic black spot within with golden green between the 2nd subcostal and discoidal nervure; a narrow oblate black spot surrounded in the green space between the discoidal nervure and 1st median nervule, a decrescentic black spot in each of the two succeeding intervenal green spaces, a large vittæform clavate black mark between the 3rd median nervule and the submedian nervure extending nearly from the base to within a short distance of the anal angle. The golden green increases in width towards the base, diminishing towards the outer margin, where it is lost in the golden yellow that then extends to the anal angle, the green of the latter 3 intervenal spaces is broadly framed with fuscus black along the median nervure as it is within the cell, and on each side of the 3 median nervules, being most prominent down the 2nd branch and reaching to the narrow outer marginal border, where a portion of the vein is picked out in yellow; the abdominal fold which if flattened out would be of considerable breadth, has the row of long reddish-ochreous hairs in a line down the middle of it, and is of a luent brown as stated before.

Head: eyes very dark brown, large and prominent; antennæ velvety black; 37 millims. in length.

Thorax and prothorax, a rich fuscus black; the central longitudinal stripe metallic silvery green; breast with coral red or crimson spots, and deep black beneath.

Abdomen, a rich pure orange lemon yellow; in each of the 4th and 5th segments are lateral faint black spots formed by atoms and the usual trigonal, sinuate black mark above the anal valves; there are also traces of the lateral subdorsal black dots usually found in this group; the subdorsal yellow is much subdued by black atoms and scales, and a tuft of shot ochreous pulvilli close upon the meta-thorax.

Length of costa, 85 mms.; width of primary wing, 42 mms.; length of secondary wing, 45 and width 47 mms.; of thorax and head 22, of abdomen, 37 mms.

Length of legs { 1st pair femur 11, tibia 8, tarsi 13 mms. } including
of legs { 2nd " " 12, " 15, " 14 " } the tro-
{ 3rd " " 11, " 13, " 15 " } chanter.

Hab. Halmahera, Gilolo. First taken by M. Lorquin.

♀ Primary wings subtriangular, sufficiently narrow, the costa very slightly arched, external margin nearly straight, interior margin only slightly curved. Posterior wings sufficiently shorter, scalloped; abdominal margin the normal shape of the ♀♀ of the genus.

All the wings on the upper surface fuscus black; the spots and markings of the primaries are sordid greyish white, caused by the grey white being equally and thickly powdered with fuscus black atoms; the light portions of the secondaries are a reddish fuscus grey, all except the discoidal cell which is whiter—this red or ferruginous tint somewhat intensifies towards the posterior margin, even on the fuscus black border. Primaries: discoidal cell almost entirely occupied by the sordid white, narrowly separated from the veins by the black, still more from the base towards which it graduates so as to give the white area a subpyriform appearance, with the upper *pseudoneurus* well defined in black, and slight traces of the 2nd, also a small crescentic indentation at the point close to the 2nd discoidal nervule, where the fold runs across the nervule; in the triangular space between the 2nd and 3rd subcostal nervules and running a short distance, white; between the 3rd and 4th an elongate white patch interrupted irregularly by black extends exactly half-way to the apex, or rather the posterior margin—the 2nd outer division of this patch being nearly tetragonal; between the 4th and 5th, one small spot close to the base of the nervules, and an exterior patch irregularly prolonged outwardly into two faint striga; between the 5th subcostal and the 1st discoidal nervules are two white marks, the inner one subrectangular, curved at the apex and strongly and deeply crescentic at its base, the outer one large and cuneiform, sinuate at its base—with a considerable space between the two; in each of the 3 spaces bounded by the 1st discoidal and the 2nd median nervules are similar long rectangular white marks indented or sinuated at their base, and smaller outer white marks varying in size and more or less cuneiform and bisinuate at their base; between the 2nd and 3rd median nervules, an elongate rectangular or tetragonal mark, crescentic at the base, and an irregular, bisinuate small mark below; between the 3rd median and submedian nervure, the mark is nearly the width of the space at its base, is bisinuate, and divided visibly by the submedian fold, the upper division extending narrowly parallel with the median vein at a short distance from it to exactly half the distance from the base of the wing; the portion below the fold is only about 2-3rds the length of the upper, narrower, and acuminate, giving the whole mark a subtetragonal outline; the white marginal mark is subfusiform and indented.

Secondaries: discoidal cell nearly occupied by white; i.e. to within 1-3rd of the base; posterior margin of wings with an irregular vittæform border of black, sinuated or deeply indented; the space between the veins is sordid ferruginous white, and may be considered to contain 6 black spots sinuate below and acuminate above, the 1st (Felder would regard it as the 2nd) between the 1st and 2nd subcostal nervules being of irregular form, and the 6th between the 3rd median nervule and the submedian nervure being the longest and most acuminate; below these the ferruginous grey is more orange, and more densely sprinkled with fuscus; between the costal nervure and 1st subcostal branch the space is black, with an elongate sordid ferruginous white mark extending midway nearly to the precostal nervure, and an irregular marginal spot near to the anterior angle.

All the wings with whitish fringe crescents.

Wings beneath: primaries with very fine rich fuscus brown and ochreous sordid white. Secondaries: the brown narrower in colour than above, the white strongly saturated with ochre, graduated to an ochreous orange below the black spots. All the light markings the same as on the upper surface, except the large black spot between the submedian nervure and 3rd median nervule, which is strongly dentated below. The yellow below the black spots in each case forms a distinct acuminate area. The veins of all the wings above and below are strongly accentuated in black. A few lemon-coloured atoms are scattered in the brown on each side of the subcostal nervure of the lower wing.

Head: eyes dark pearly brown, with ochreous border; antennæ, smoky dark brown. Thorax: a rich fuscus brown, with pale green longitudinal central stripe, faintly visible; beneath, posterior half, laterally crimson scarlet, anterior half fuscus black.

Abdomen: sulphur grey; laterally with lemon atoms—the last two segments yellow; an ochreous anal tuft; last segment with a dorsal patch of ferruginous hairs; dorsal portion of abdomen, fuscus brown; a longitudinal brown dorsal mark on the anal segment; subdorsal rich orange yellow, with lateral black dots, and deep black segmental lines.

Legs black.

Length of costa, 98 mms.; width of primary, 53 mms.; length of secondary, 63, and width, 52 mms.; length of abdomen and antennæ respectively 35 mms.; of thorax, including the head, 24 mms. The legs of the type were too imperfect to be measured.

Hab. Halmaheira, Gilolo. Discovered by M. Lorquin.

♂ In the Museum of Messrs. Godman and Salvin:—On the costa of the primaries is a thin faint line of orange atoms over the black; the black of these wings has less fuscus than in the type; a slight yellow streak appears on the subcostal orange band not far from the apex, this is seen on both surfaces of the wing; the band also is wider and more elegantly formed than in the type, occupying nearly the whole of the cell, slightly more obtuse towards the apex, nearer to the costal margin, and extending over rather more of the disc from the costa to the space enclosed by the first and second discoidal nervules; in addition, a cuneiform spot of the orange is found in the next space close to the third discocellular nervure. The pupæform sexual brand or patch is rather narrower and more delicately outlined. The secondaries with the brassy or golden yellow within and without the cell with a slightly greenish tinge; the four discal spots are smaller and more wedged shape than in the type, and there is an absence of the two brassy yellow marginal spots between the costal nervure and second subcostal nervules; the black of the posterior margin is also narrower; on the abdomen the black mark on the anal segment is larger than that of the type; but the neurulation of the upper wing does not occupy relatively the same place, each vein being slightly nearer the direction of the costa. [See Fig. 1, in plate following the colored plate of this species.]

Underside, the area of the green in the cell is less; the markings of the disc are generally of a different form; a

peculiar wedge-shaped yellow mark within the green atoms is found on the space between the third and fourth subcostal nervules; the claviform line on the submedian fold is nearly obsolete; the outline of the brassy yellow between the costal nervure and first subcostal branch, is on the hind wing visible from the upper surface, and thereby produces a contrast in the density of the yellow patch; the green of the cell comes close to the veins, and the discal black spots are smaller; the black margin is very narrow. [See Fig. 2, in plate named above.]

♀. In the same collection, the sordid white of the discoidal cell extends to the base, is separated from the median nervure and discocellular nervules by black, which unites above with an elongate irregular patch of the same colour, following the course of the first and second *pseudoneura*. The space occupied by two white marks between the third and fourth subcostal nervules in the type, is here filled in entirely with white; the lower division of the white area between the third median branch and the submedian nervure extends nearer to the base; and a clouding of white atoms is found in the interior margin. The black border of the secondaries is regular in its situation, and quite symmetrical on the two wings; the colour of the hind wings is graduated to a deep fuscus over the lighter parts, and little or no yellow is seen except in the spaces immediately near the costa. The sordid grey of the upper wings is beautifully dark, regular, and dusted with atoms. Other differences will be seen by reference to Fig. 3, in same plate. Length of costa of ♀ 105 mms.; with the primary wing 51 mms.; length of secondaries 64, and width 43 mms.; length of abdomen and antennæ 35, and the thorax with the head 25 mms.

	(1st pair, femur 13, tibia 11, tarsi 17 mms.
Legs 2nd	" " 13, " 14, " 19 "
3rd	" " 14, " 16, " 19 "

Hab. Gilolo.

The ♀ of this species is very remarkable. On the upper wings, although the whole common plan of the markings appears to be the same as that of other females of the genus, these are so extended and modified in shape as to suggest a *danaoid* pattern. The hind wings are also by the simplest means, *i.e.* occupying nearly the whole of the discoidal and discal space with lighter colour—only retaining and increasing the number of black spots, made to look quite *acreoid*. The insect, therefore, bears unmistakable evidence of its being intended as a mimic of some *danaoid* or *acreoid* species, probably as a means of protection.

This, therefore, suggests to us the possibility of the species being dimorphic in the ♀ sex, as is the case with so many of the *Papilionidæ*. The normal type ♀ may already be in our collections without our knowing it or may yet be discovered. It is not unreasonable to infer that in Batchian an *acreoid* ♀ form of *cræsus* may exist, and ultimately be found. But the present non-existence of such forms in either locality might only mean that they did once exist, but have since disappeared in the struggle for existence. That there is a tendency towards the mimicry of the *danaidæ* by the ♀♀ of the *Ornithoptera* especially when we reach the subgenus *Ætheoptera*, we shall be able possibly to demonstrate later on.

M. Wallace's ♀ from Gilolo which he describes in the *Linn. Trans. Soc.*, vol. xxv., p. 37 (see the article on *P. cræsus*)

is a close ally of the ♀ of *lydius*, probably only a variety of it.

If we compare the ♂♂ of the two species *cræsus* and *lydius*, we find that the secondary wings of the former are generally without black spots, or that they never are more than two in number, one of them being almost obsolete; in the type of *lydius* there are four well-marked black spots. The orange colour of all the wings is lighter, and more shot with green, though intermediate gradations of colour are met with in the various specimens of *cræsus* till we reach the gorgeous colouring of *lydius*; the very red variety of the ♂ in the Hewitson collection which I describe in the article on *cræsus*, if not an example of *lydius* is certainly a close link between the two species. The semi-diaphanous or brassy lemon mark on the lower wings of *lydius* within the cell and outside, occupies a very extensive area, but a relatively small one in *cræsus*, being generally broken up into small marks and spots—very small in an example in my collection; but in *cræsus* there are more marginal brassy spots, four in my example. The orange of the lower wing of *lydius* is more dusted with black atoms, and the median and other veins are more strongly accentuated than in *cræsus*. The costal longitudinal band of the upper wing is narrower in *lydius*

than in *cræsus*: in the cell of *cræsus* it becomes quite pyriform. On the under surface of the primaries of *lydius*, the green occupies the greater portion of the cell; in specimens of *cræsus*, it is only a comparatively small spot, of course, varying in different examples. In *lydius* the green discal spots of the upper wings are graduated to blue towards the outer margin; in *cræsus* they are golden green. In *lydius* between the 3rd median branch, and submedian vein there is an elongated black mark; in *cræsus* this is absent, but there are sometimes indications of this mark in atoms, and probably in a number of individuals would be found some with or without the mark, as I have shown in the plate of *Richmondia*.

It is to be observed that the colour bands always found on the posterior and exterior margins of the Primaries of the *Priamus* group (least developed in *O. Richmondia*) are entirely absent from *cræsus* and *lydius*, with the exception of the orange mark at the posterior base of the wings.

The types are in the Felder collection, now in the museum of the Hon. Walter Rothschild. The species is also in the museums of Messrs. Godman & Salvin, M. Ch. Oberthür, of Rennes, &c., but at present is a comparatively rare insect.

O. PRIAMOPTERA URVILLIANA.

- Papilio Urvilliana*, Guérin, *Voyage de la Coquille*, t. 13, f. 1, 2. (1829).
Ornithoptera Urvilliana, Boisduval, *Species Général* I. p. 175, n. 2. t. 17. f. 1. (1836). (*Suites à Buffon. Lépidoptères*).
O. Urv., d'Orbigny, *Dict. d'Histoire Naturelle*, Atlas, Zool. II. *Lépid.* t. 1. (1849).
O. Urv., Doubleday and Hewitson, *Gen. of Diurnal Lepidoptera*, I, p. 42, (1846).
O. d'Urvilliana, Chenu, *Encyclopédie d'Histoire Naturelle*, p. 34 (1857?).
O. Urvilliana, Salvin and Godman; *Proc. Zool. Soc.*, p. 147 (1877).
Pap. Priamus, var. h. P. *Urvilliana*, Kirby, *Synonymic Catalogue of Diurnal Lepidoptera*, p. 517, (1871).
O. Priamus, (v. *Urvilliana*) Dr. C. Fickert, *Ueber die Zeichnungsverhältnisse der Gattung Ornithoptera*, p. 712 (1889).
O. Urvilliana, Oberthür, *Études d'Entomologie* (Cat. Raisonné de Pap. de la Coll. de Ch. Oberthür), p. 29.

The ♂ of this species was first named by Guérin and figured and briefly described by M. Lesson in the "Voyage of the Coquille" in 1829. The type is in the Paris Museum.

In Boisduval's "Suites à Buffon" is a figure of the ♂ of which only one side is fully drawn—the other being merely in outline.

Chenu, on page 34 of the vol. devoted to Papilionidæ, gives a woodcut of the under surface, with a description copied from Boisduval.

Lesson gives a short diagnosis:

♂ "*Alis holosericeis supra cyano-violaceis, limbo nigro; anticis fascia longitudinali latissima posticis maculis submarginalibus nigris, his dentatis.*"

Wing, velvety; above, with violet-blue, which is lost in the black border (i.e. fringed with black atoms at the edges of the general black ground). Anterior wing with broadish longitudinal band near the outer margin. Posterior wing with submarginal black spots, and dentated (or scalloped).

Boisduval's description is longer: "*Taille et port de Priamus le vert des ailes supérieures remplace par du bleu-violet très brillant. Ailes inférieures d'un noir de velours, ayant les nervures et la partie comprise entre la cellule discoidale et le bord interne ainsi que la bordure postérieure, d'un bleu-violet très brillant; cinq taches noires, ovales-oblongues sur la partie blue bord abdominal d'un jaune doré, garni de poils de la même couleur. Dessous des ailes supérieures ayant à peu près la même dessin que dans Priamus; les taches violettes à reflet d'un jaune doré. Dessous des inférieures d'un jaune doré, à reflet bleu ou un peu verdâtre sur le milieu; sept taches noires disposées comme dans priamus, mais plus petites que celles du dessus; une petite tache d'un jaune orangé, peu marquée, entre la base et la tache noire orbiculaire las plus externe. Thorax noire, marquée d'un raie médiane violette. Tête et antennes noires. Abdomen entièrement d'un beau jaune. Côtes de la poitrine marqués d'un peu de rouge.*"

Form and general appearance of *priamus*. The green of the upper wings replaced by a very brilliant blue-violet. Lower wings velvety-black, having the nervures and the space within the discoidal cell, the inner and the hind margin also of a brilliant blue-violet; five oblong oval black spots upon the blue.

The abdominal of a yellowish gloss, garnished with hairs of the same colour. Underside of superior wings having nearly the same pattern as in *priamus*. The violet spots reflecting a golden green. Underside of inferior wings of a golden-yellow, reflecting a slightly greenish-blue above the middle; the black orbicular spots arranged as in *priamus*, but smaller than those on the upper surface. A small faint spot of orange yellow between the base and the outer black spot. Thorax black, with a central ray of violet. Head and antennæ black. Abdomen entirely of a beautiful yellow. Sides of the breast with a little red.

The only two specimens known for many years, one of which became the type of the species, were taken at Port Praslin, New Ireland, by M. Durville, who, in the notes which he wrote during his leisure times at Port Praslin, says that "these butterflies fly slowly at the tops of the trees, on the leaves of which they rest." The author also considered this insect to be a *var.* of *Priamus* [p. 273, Vol. II., Zoologie.]

In the fig. published in the "Voyage of the Coquille" the eyes are blue-violet. This is a mistake—the colour being more nearly a dark madder brown. The differences between the type and the specimen from which my fig. was drawn are, that on the upper surface of the hind wings four of the orbicular spots are larger than in mine, reaching to the discocellular nervules, though starting from the same point; the fifth extends half-way down the space bounded by the sub-costal and costal nervures; the space included in the discoidal cell is quite black, and is not *graduated* by black atoms; and between the first and second and third median nervules is a blue lunular excavation in the black border. Length of the costa in his insect 85 millimetres; of hind wing 47; of antennæ 35; breadth of fore wing 44; of hind wing 37 mms.

Dr. C. Fickert describes this species briefly—the most notable part of his description being: "*Die Vorderflügel zeigen unten die Zeichnungsverhältnisse von euphorion, nur sind die Flecken blau statt grün.*" The fore-wings on the underside exhibit the markings of *euphorion*; only the spots are blue instead of green. He also speaks of the head and breast as having the same appearance as those of *cassandra*. "*Kopf, Brust u.s.w. wie bei cassandra.*" His specimen was from New Mecklenburg.

In one ♂ in the Brit. Museum there are traces of scarlet scales on the upper surface of the superior wings within the pre-costal nervure; and the colour patch containing

the internal nervure is of a bluish-green with black atoms. The spots on the lower wing are only four in number, nearly oval, and almost of uniform size. The hind-marginal border extends only half way from the anal angle, the remaining half being only faintly indicated towards the apex of the wings.

The median and sub-costal nervures are deep-black, as is also the sub-median. All the rest are only faintly seen in the blue. Length of costa 84; antennæ and abdomen (allowing always for the anal curve) 35; thorax 15; head (width) 7, (length) 4 mms.; articulations of antennæ, including basal joint, 42 in number.

This very nearly agrees with the original of my figs. in colour and markings, except that the blue patch within the discoidal cell of the under surface is more extensive, and the blue band on the hind margin of the upper surface of the superior wing is more complete, *i.e.*, not so strongly divided by the nervures, and extends from the anal nearly to the anterior angle. The locality of this specimen was New Ireland.

From the time of the discovery of this species till 1877, M. Durville's specimens were the only ones known, till the Rev. Mr. Brown, a Wesleyan Missionary, sent a series of both sexes to the collection of Messrs. Godman and Salvin, thereby giving us an opportunity of knowing what the ♀ was like. In their paper, in Proc. Zool. Soc., Godman and Salvin say that "the ♂'s present a slight amount of variation *inter se.*, one having the characteristic blue markings rather purer than the other, in which a slightly greener tint prevails." This has been the case with many of the specimens which have reached us since: as might be expected they only indicate local variation. The wonder is that this variation is not greater. In addition to the colours which the ♂ presents on its different surfaces, many beautiful opalescent and other tints can be seen by looking at it from different directions, and in different degrees of light. These, as I hope to show in another section of this work, have a very important meaning. On the ♂ from which my figs. were drawn, in certain positions the entire violet-blue band along the costa presents tints ranging from fiery-salmon to richest emerald green; the blue scales on the lower wings become a delicate fawn colour; the extremely delicate velvet-black of the upper wings is shot with opalescent violet-green; the ♂ sexual sericeous patch of velvet-brown on the upper wings ranges from sooty black to a very warm-red velvet brown. The underside is opalescent on all the wings, viewed obliquely: the green of the lower wings becomes a fawn-greenish blue, or delicate purple-salmon, and the blue on the upper wings is a fiery-salmon. These are highly suggestive of the colours of *O. Cræsus*.

The following are the measurements of the costa in three specimens belonging to Mr. Janson; 88, 86, and 89 mms. respectively.

♀. Godman and Salvin, in their paper, gave a short description; the ♀ "resembles that of *O. Priamus* itself, being of a sordid brown colour, the lighter markings being also dingy and not well defined as in *O. Aruana*. In form and position their marks correspond to those of the ♀ *O. Priamus*. The anal angle is however more produced, a characteristic also shown in the ♂." Proc. Zool. Soc. p. 148, 1877.

The depth of the brown on the wings varies greatly in

different examples. In some it is very dark, in others extremely light. The white markings of the lower wings are often so dingy as almost to merge into the brown—this effect being caused by the brown scales which are spread over them, and graduated in number from the base of the marks. The white spots on the upper wings are generally much lighter, and sometimes faintly fawn-tinted, while this tint is more strongly indicated on those of the lower wings. The abdomen is of a burnt sienna yellow, tinged with green towards the thorax, with dorsal triangular cloudings on four of the segments, and small orange-black lateral dots seven or eight in number. On the underside of the wings the white markings are much more strongly tinted with burnt sienna-yellow, especially the outer half of those on the hind wings: all the large semi-orbicular and conical spots enclosed by these are very black, the hind marginal border of the hind wings being nearly as intense; those of the superior wings are faintly seen through on the upper surface. The veins of the wings on both surfaces are rich brown-black. The under-side of the abdomen is orange-yellow, reddish at the anal extremity, with heavier black dots, and black on the subdorsal articulations; the sides of the breast with a rich vermillion patch occupying all but the lower part near the trochanters; legs and tarsi black; eyes warm brown; antennæ black. Viewed obliquely, and in different positions, all the browns are velvety purple-brown; opposite the light a ruddy ochreous brown with greenish tints in parts.

A specimen in Mr. Dannatt's collection is much lighter in colour. The upper wings are white brown, with a faint green tinge; lower wings white brown with ruddy tinge; underside of upper wings slightly darker with ruddy tinge, but changing like shot silk as the insect is moved about; lower wings light reddish ochreous-brown except on the spots and band. Expanse of costa 104 mms.

Four ♀♀ In Mr. Janson's collection, expanse of costa 87, 97, 105, 106 mms. respectively.

♀ In Brit. Mus. Length of costa 100; length of antennæ and abdomen 44; of thorax 15; of collar 4; and of head 3 mms. Width of head 7 mms., divided by the eyes into three nearly equal parts. Width of collar 7 mms.; probable width of thorax 11 mms.

The ground colour of this specimen on the upper side is much paler than in my fig., especially of the superior wings. The spots within the white of the inferior wings are much smaller. Length of legs: first pair; femur, 13; tibia, 9; tarsi, 19 mms. Second pair; femur, 14; tibia, 16; tarsi, 18 mms. Third pair; femur, 11; tibia, 15; tarsi, 20 mms.

Specimens from which the plate was drawn—Habitat, ♂ New Ireland; ♀ Solomon Islands, (but which of them I could not learn).

The number of articulations in the antennæ of Mr. Crowley's ♂ are 46; of his ♀ 56; of Mr. W. Dannatt's ♀ 50, though it is a larger specimen,—the length of the costa of the former being 99, and of the latter 104 mms.

The abdominal fold of the ♂ is more open and simple than in the ♂♂ of the *Pompeoptera*; and does not enclose a cottony deposit. [The sexual brand, or sericeous pupæform transverse patch take the place and function of the latter in the true *Ornithoptera*, probably.] The fold of the ♀ is almost obsolete, or only presenting a concave depression.

I am indebted to the kindness of Mr. Philip Crowley, of Croydon, for the opportunity of figuring this species from his splendid collection.

In the Colls. of Brit. Museum; Messrs. Godman and Salvin (where the type ♀ is); Hon. Walter Rothschild;

M. Ch. Oberthür, of Rennes; the Author; Mr. Crowley; Rev. Dr. Francis A. Walker; Paris Museum, where the type ♂ is, Mr. C. J. Lambert, of Exeter, and many others.

Most of the collections are enriched with a good series of each sex.

O. (PRIAMOPTERA) URVILLIANIA, *Var.*

A ♂ example of this species from Duke of York's Island, belonging to the Hon. Walter Rothschild's collection, is on the upper surface of a rich green blue, or cærulean blue, set against the general discal black, the latter being so intense by contrast as to produce a most vivid effect of darkness to the eye, unrelieved by the light sheen that is usually found on the black portions of many of the Ornithoptera. When viewed opposite the light the blue becomes very richly tinted at the edges with green, and the general appearance begins to suggest a close alliance with *O. Eumæus*, Rippon; but if it be examined against the light the lower wings become almost purple blue, and the subcostal band a light dead cærulean blue: more obliquely the lower wings and the marginal band of the upper are violet, shot with a silvery opalescence, and the subcostal band a pale dead lilac, with a sunny opalescence. In some lights portions of the blue are of an indescribable beauty, all of which, in every position, heightens the glory of the golden yellow abdomen; the sexual brand is a very dark smoky brown, scarcely distinguishable in some positions from the black; a couple of orbicular black discal spots are found on the lower wings between the first and second subcostal, and second and discoidal branches; as usual also the interior of the discoidal cell from the base, and outward, is nearly black—the blue scattered in atoms on the black, rather than the black on the blue; the thoracic longitudinal mark is beautifully formed, and of the splendid metallic blue green I have mentioned before as found in the coleopterous genera *Eupholus* and *Cyphus*, and also on the Pyrenean *Lamillicornes*, *Hoplia cærulea*. I shall give a plate for the portraiture of this variety, though it is hopeless by any art, however consummate, to worthily depict its marvellous loveliness. The black of the Primaries, on the under surface, is nearly as intense in some lights as above; the small discoidal blue patch, and all the blue discal marks are of the same colour as above, except the long subcostal streak, which is golden green—the blue marks are slightly tinted green at their outer edge. The secondaries have the usual 6 submarginal black spots; the discoidal cell and 5 of the spaces between the branches are blue as far as the spots, the two upper spaces are green suffused with blue, and all the spaces between the spots and the black border are golden green. The abdominal marginal fringe consists of long hairs somewhat like the light fur of some vertebrate animal.

Length of costa 84 mms.; of antennæ or abdomen 32 mms.

A ♀ accompanying the above var. is a very light soft satiny brown colour on the Primaries, except at the outer margin, the apex, and a little within the submarginal white marks; the same may be said of the secondaries, except that darker brown is graduated upwards and towards

the base till it is lost in the satiny light brown of the cell: here, however, this light brown is seen through a mass of long delicate hairs which extend from the base and cover 2-3rds of the wing. [It is only in certain positions that these hairs can be seen, and then it is found that they stand up 3 or 4 mms. above the surface of the wing.] The white marks of the wings are sordid subdued white, very indistinct in the cell of the upper wing; in the space between the 2nd and 3rd median nervules, above the submarginal white wedge-shaped mark, is a peculiar semi-obsolete clouded mark, somewhat like a small cirro-cumulus cloud.

The thorax is a direct contrast with the wings, being black and pilose, with the structure and arrangements of the hairs well defined; this black extends from the base of the wings along part of the costa, and helps to accentuate the neururation, which is very strongly and boldly exhibited on all the wings—though the submedian and internal nervures are of the general satiny light brown of the wings.

On the underside the primaries have the dark satiny browns irregularly mixed; the light markings very white grey; the discocellular mark much larger than on the upper surface; the fringe lunules are ochreous white. The secondaries very light satiny brown; marginal border rich dark brown; the sub-n-arginal spots of the same colour; the acuminate marks greyish fuscous white, the two upper ones yellower; fringe lunules of the same tint. The abdomen is very robust (probably because the insect was captured before she could deposit her Ova); light grey above, a little fuscous on the last three segments, with an interrupted smoky brown dorsal stripe. Subdorsal, yellow, with large black lateral dots, and the segments strongly defined subdorsally by black; the anal segments and tuft are deeply red ochreous.

Length of costa 110 mms.; of abdomen 42 mms.; greatest width of abdomen 15 mms.

Hab. Duke of York Island.

In the museum of the Hon. Walter Rothschild, to whom I am much indebted for the privilege of describing it, and figuring these varieties.

A ♂ in my own museum is midway in colour between the above ♂ and the normal type figured in my first plate from Mr. Crowley's collection, but is richly violet in one position, with a pale greenish cærulean subcostal band; there are four suborbicular discal spots on the lower wing. The black outer margin is very narrow on all the wings; the abdominal fringe a more burnt sienna colour than usual. On the under surface of the Primaries the marks are green blue, except the two upper ones, which are rich golden green

followed inwardly by green atoms. The secondaries are golden, subdued through half the cell and lower half of wing by cærulean blue, and between the 3rd median branch, and sub-median nervure by rosy atoms on the blue green; a longitudinal golden mark occurs in the green below the costal nervure. The sub-marginal black spots are 7 in number, and vary in form as usual.

Length of costa 84 mms.; of abdomen or antennæ 35 mms. respectively.

Hab. unknown; but probably Duke of York Island.

The appearance of the accompanying ♀ will be best shown by the plain figure which may be found in the plate devoted to these varieties.

♂. In the museum of the Hon. Walter Rothschild, this very striking variety is quite a delicate light violet on all the wings, but deepest and richest in the band running up the exterior margin; but this colour is greatly modified in parts by grey greenish atoms, which, on the lower wings, and the posterior angle of the upper wings gives it a slightly greenish-brown appearance, which is especially noticeable in the discoidal cell of the secondaries, where the black atoms tend to reveal it more fully. In parts where these atoms do not appear the violet colour is singularly beautiful, and is most intense when seen opposite the light. When viewed against the light the whole of the wings look leaden in colour, and smoky on the black, with golden reflections: the sericeous sexual patch, or brand, appearing quite a brown-red by comparison,

though its normal tint is smoky brown. There are two almost obsolete black discal spots on the secondaries; the thoracic stripe is also violet and green.

The shape and size of the sexual brand differ considerably from those of other species, being more ragged in outline at the lower edges, longer than in some species, with the point towards the hind margin often nearly separated from the main pupæform mark, and generally appearing as a small head. [See the 2nd Plate illustrating this species.]

The underside of the variety before us strongly suggests the under surface and markings of *O. Pegasus*—the green of the lower wings being a combination of vegetable green, golden green, blue green, and violet green, with lemon-coloured streaks at the anal angle, and one or two outer marginal spots; the black suborbicular spots of the hind wings are 6 in number, and much like those of *Pegasus*. The colours of the upper wing on the same surface, are quite subdued peacock-blues and greens. The abdominal marginal fringe consists of long light burnt-sienna hairs.

I may here remark that this fringe of hairs is peculiar to the true Ornithoptera and Pompeoptera: those of the Pompeoptera and Ætheoptera subgenera differing considerably in length and in other respects.

Length of costa 72 mms.

Hab. Probably Duke of York Island.

ORNITHOPTERA EUMÆUS.

BIBLIOGRAPHICAL REFERENCES ADDITIONAL TO THOSE ON PAGE 30.

- Troides Priamus* Poseldon, ab. (c 2) ♂ *Eumæus*, W. Rothschild, Nov., Zool., Vol. II., p. 189 (1895).
 „ *Eumæus*, W. F. Kirby, Nature, Vol. LI., p. 256, col. 1 (1895).

O. (PRIAMOPTERA) CRÆSUS.

BIBLIOGRAPHICAL REFERENCES ADDITIONAL TO THOSE PRINTED ON PAGE 33.

- Ornithoptera Cræsus*, Koch, Indo-Austr. Lep. Fauna, p. 38 (1865). ♂ ♀.
 „ „ Ribbe, Iris III., p. 42, t. I. f. 1-3 (1890). Batjan (or Batchian); Life History of the species
Troides Cræsus, W. F. Kirby, Nature, Vol. 51, p. 256, col. 2 (1895).
 „ „ W. Rothschild, Novitates Zoologicae, Vol. II., p. 192, n. 2 (1895).
 „ „ W. F. Kirby, Handbook to the Order Lepidoptera, Vol. II., p. 255 (1896).

♂.—In British Museum, *ex*. Godman and Salvin collection, very light orange; viewed obliquely, emerald or olive green. Underside of the hind wings very emerald green, with golden orange marks. Hab. Batchian. ♂ very red orange; underside of hind wings much lighter green; the darks are dark brown, very like *Lydius*. ♀ ♀. The cell marks very varied, one with three divisions, one with four, and one with the mark very irregular and sinuate in form. Hab. Batchian (or Batjan: the correct Dutch spelling). Wallace's example.

♂.—In the museum of Mr. H. Grose-Smith, a bred specimen (from Staudinger) is smaller than are the Wallace specimens; and the orange areas are very light golden lemon; on the posterior wings the area of the disc outside the golden orange patches, and around that of the cell has a delicate greenish tint, as intensely golden emerald green when viewed obliquely as in *O. Aruana*. Opposite the light the two wings become very richly

orange; the dark portion of the wings are warm dark brown towards the outer margin, and enclose the light red-brown velvety stigma; the longitudinal thoracic mark is a metallic emerald green. The under surface of the wings closely reminds one of that of *O. Cassandra* save for the broad, subcostal band, and the interior marginal area of orange green almost enclosing the internal nervure from the base; there is no other trace of orange on the wing. In the Wallacean specimens a faint submarginal band of orange atoms is often found extending from the inner margin and running parallel with part of the outer margin.

The bred specimens of the ♂ of this species appear to be always smaller and less deep orange than are those that have been captured in their own habitat. [See Pl. 13.]

Length of the costa of this example, 75 mms.; of the costa of fig. 2, pl. 13, 83 mms. The latter is from Batjan.

O. (PRIAMOPTERA) LYDIUS.

BIBLIOGRAPHICAL REFERENCES ADDITIONAL TO THOSE PRINTED ON PAGE 36.

- Troides Lydius*, W. F. Kirby, Nature, Vol. 51, p. 256, col. 2 (1895).
 „ „ W. Rothschild, Novit. Zool., Vol. II., p. 194, n. 3 (1895).
 „ „ W. F. Kirby, Handbook to the order Lepidoptera, Vol. II., p. 256 (1896).

O. (PRIAMOPTERA) URVILLIANA.

BIBLIOGRAPHICAL REFERENCES ADDITIONAL TO THOSE PRINTED ON PAGE 41.

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 " " Butler, "Lep. of the South Sea Islands," Proc. Zool. Soc. Lond. (1874), p. 288. [Also *ibid.* (1879), p. 159.]
 " *Priamus*, v. *Urvilliana*, Stalldinger and Schatz, Exot. Schmet. I., p. 4 (1884). ♂ ♀.
 " *Duvilliana*, Woodford, Proc. Zool. Soc. Lond., Woodford, p. (1888). ♂ ♀.
 " *Urvilliana*, Mathew, Trans. Ent. Soc. Lond., p. 169 (1888).
 " " Pagenstecher, Jahrbuch Nass. Ver. Nat., p. 67, n. 3 (1894).
 " *Pegasus*, v. *Bornemanni*, Pagenstecher, Jahrb. Nass. Ver. Nat., p. 65, t. 3, f. 2 (♂) (1894). New Britain.
 " *Urvilliana*, C. Ribbe, Figures and Descriptions, Iris, July 15 (1895).
Troides Priamus Urvillianus, W. Rothschild, Novitates Zoologicae, V. II., p. 191 (1895). [Also ab. loc. *bornemanni*, p. 191.]
Troides Urvillianus, W. F. Kirby, Nature, Vol. 51, p. 256, coll. 1 (1895).
 " " " Handbook to the Order Lepidoptera, Vol. II., p. 255 (1896).

While the local variations of this species may be broadly divided into distinctly recognised types of colour, as blue and blue green; if a long series of the ♂ are brought together from the different localities in which they were found, a multitude of connecting graduations of tint will be presented, ranging from extreme violet to extreme green blue. The undersides will also present a number of variations of tint on both wings. The amount of variation in the number, size, or shape of the spots, or the extent of black dusting of the upper surface of the hind wings, will differ in each example. Whether the extreme manifestants of these colours are ever to be found flying together in company it is not yet possible, though it would be interesting, to know. As our knowledge at present stands the *green* forms are chiefly confined to New Britain and New Ireland; the *blue* forms inhabit certain of the Solomon Islands, the New Hebrides (?), and New Guinea. The females vary very much in depth of colour (from light to dark), and number, shape, and size of markings: this is especially the case with respect to the discocellular patch of the upper wing—it being very large in some, and almost obsolete in others. [See Pl. 17, figs. 5, 6, 7.]

I may mention also that in New Britain the ♀ ♀ of *O. Aruana* are difficult to separate from those of *Urvilliana*, if a series of the two are mingled together, one of the chief distinctions being the yellower tone of the under-surfaces of *O. Aruana*.

On Pl. 17, figs. 2, 3, are portraits of a tolerably extreme green blue example of the ♂, which comes pretty near the *var Bornemanni* of Pagenstecher, which I had the privilege of figuring from the museum of Dr. Francis Walker. It has the typical markings on the hind wings: its vivid blue green is so intense, uniform, and silky when viewed opposite the light, as to suggest a close affinity with *O. Eumæus*, the hind wings exhibiting the greatest amount of golden tint; against the light the hind wings are greenish violet, the outer-marginal band of the front wings opalescent violet, and the subcostal band a dead undefined green. The amount of black on the hind wings also causes them to appear, when viewed obliquely in any direction, almost entirely and intensely velvety black. The markings of the underside are most nearly like those of *O. Priamus*. Length of the costa, in a direct line, 81 mms.

♂. In the collection of the British Museum (*ex* Godman and Salvin collection), primaries a rich violet. The submarginal terminals of the veins and folds are so

strongly expressed and arranged, that the submarginal band, instead of being continuous as in many other examples, is caused to appear as a band of strongly lunate blue spots. This specimen, with an accompanying ♀, is labelled *New Hebrides*?

♂. Brit. Mus., *ex* Godman and Salvin coll. Centre of hind wings light blue on the undersides. Habitat, Florida Island, Solomon group. 6 ♂ ♂ and 3 ♀ ♀ collected by Mr. Woodford from this locality are in the collection.

♂. Brit. Mus., *ex* G. and S. coll. Rather lightish blue; the submarginal row of black spots on the under-surfaces very large and varied. ♀, large and light in colour. Hab. Aola, Guadalcanar: Solomon Islands.

♂. Brit. Mus., *ex* G. and S. coll. The blue delicate in tone; the spots medium size; the wings not so intensely dusted with black atoms. Hab. Fauro Island: Solomon Group (Woodford).

♀. The discocellular mark of the primary wings almost obsolete. ♀, with the same mark rather obscure, the wings are also very melanistic on the upper surface. Hab. Fauro Island: Solomon Group (Woodford).

♀. Small example, light brown; marks very light, and larger than in the preceding. Hab. Fauro Island: Solomon Group (Woodford).

♂. Same collection. Colour ranging from violet to green, according to the light. Underside of primaries blue, of secondaries golden green and blue green; the black spots all large. Hab. New Ireland.

♂. Brit. Mus. Secondaries with four small orbicular spots, the fourth almost obsolete. Hab. New Ireland.

♂. Brit. Mus. *ex* G. and S. coll. (two ♂ ♂ and six ♀ ♀), *var. Bornemanni*, Pagenst. The costal band of the primaries is golden green from the base to the blue green at the apex; secondaries, greenish blue; the spots are medium size; the cell black: between the veins much dusted with black atoms—the cell slightly dusted with green atoms; some blue atoms on the black borders; under-surface of secondaries golden greenish; of primaries, golden greenish-blue. ♀ ♀ with large discocellular marks. Hab. New Britain.

For other varieties see Plates 18 and 19.

Genus, ÆTHEOPTERA, MIHI.*

♂. Primary wings subtriangular, also long and narrow by comparison with the secondaries; anal angle imperceptible or non-existent—the posterior and interior margins being united by a continuous curve to the apex; costa only slightly arched from the base to within a short distance from the apex where the curvature is much greater; secondaries narrow and elongated as in some true *Papilio*s; inner margin deeply incised to nearly a third of the wing length—thereby greatly shortening the submedian nervure—the abdominal fold extending from the anal angle to the base; along this vein on the underside proceeds the line of inner marginal ciliae which are fairly long and very prominent; the median nervure of the primaries stout and prominent, as is also the internal nervure; the other veins of both wings are delicate in structure, though much emphasized on the under surface in parts by black; the three median branches of the primaries very close together, and somewhat bent in passing through the area of the stigmatic brand; the submedian nervure is also much curved or bent; the 2nd discocellular nervule is much curved, and bent somewhat before its junction with the 1st, it is also nearly twice the length of the 1st; the discoidal cell very broad and peculiar in form, occupying nearly 2-3rds of the width of the wing, and nearly one-half its length: the cell of the secondaries long and much narrower—the 2nd division of the subcostal nervure bent inward in its course. The *pseudoneura* of the primaries as usual are four in number, the 1st branching from the 4th, at a short distance from the base of the cell, the 3rd a little above, and the 2nd a little above the 3rd and proceeding direct to the bent portion of the 2nd discocellular nervule: the 3rd and 4th within one-third of the distal portion of the cell proceed in a somewhat sinuous course, one towards the 2nd discoidal nervule, and the other to midway of the 1st and 2nd median branches; the two *pseudoneura* of the secondary cell branch off from the main stem at a short distance from the pre-costal nervure, the 1st terminating at the 1st discocellular nervule, and the second on the 3rd division of the median nervule: all these can be easily seen.

Head, eyes, and thorax black, the palpi hidden by a dense tuft of velvety hairs; thorax very pilose;

antennæ and legs black. Thorax without any green longitudinal striga. Abdomen long and sufficiently broad, anal segment subtriangulate and broader at its apex than the other segments. The anal valves most nearly resemble in outline on their underside those of the genus *Pompeoptera*. Haustellum quite long: and the femora and trochanters of the legs spring from amidst dense masses of black hairs.

The sericeous stigmatic mark or ♂ brand in the primaries is pupæform, narrow, and larger than in *Priamus* and its allies, is situated closer to the interior margin than in *Priamus*, is intensely bluish black, and thrown more into relief by the pearly opalescent character of the black within the cell, and outside the median branches, and above and below the stigma, an arrangement evidently intended to render the latter more conspicuous, as well as to intensify the beauty of the insect.

♀. Primaries subtriangular; evenly arched at the costa; posterior margin somewhat incurved midway from the anterior angle; interior margin nearly straight, but at the anal angle curving into the posterior margin; discoidal cell large, nearly half the length of the costa and very broad at the distal end; the three discocellular nervules of equal length; nervures and nervules only moderately robust for so large an insect; *pseudoneura* arranged as in ♂, but more obscure; secondaries rather narrow and long; costa rather straight along its course, though slightly incurved 2-3rds from the base; posterior margin from the apex equally lunate; abdominal margin nearly straight; discoidal cell narrow, and something less than one-half of length of wing; veins moderately robust as above—the median being fairly stout.

Head: eyes very prominent and dark; palpi rather larger than usual, but concealed by the pilose tuft; antennæ black. Thorax black, without central striga, and pilose; also black beneath; legs long and not very stout; abdomen long and moderately narrow—the anal segment being the narrowest. Type of the genus, *Ornithoptera Victoriae*.

*Since writing the diagnosis of the Genus ORNITHOPTERA, I have decided, for what I believe to be good reasons, to raise ÆTHEOPTERA, TROGONOPTERA, and POMPEOPTERA to full generic rank. Priamoptera will remain a section of ORNITHOPTERA.

ÆTHEOPTERA VICTORIÆ.

- Ornithoptera Victorïæ*, Gray, ♀, Proc. Zool. Soc. Lond., (1856), p. 7, t. 39.
 „ „ W. F. Kirby, Syn. Cat. Diur. Lepid, p. 518. (1871).
 „ „ Butler, Lepidoptera of the South Sea Islands, Proc. Zool. Lond. (1874), p. 289.
 „ „ H. Grose-Smith, Annals and Mag. Nat. Hist., vol. 19, p. 445. (1887).
 „ „ H. Grose-Smith, Rhopalocera Exotica Pl. 1, p. 1. [This is the ♂ of *Æ. Regina*.]
 „ „ O. Salvin, Proc. Zool. Soc. Lond. (1888), p. 116, p. 4.
 „ „ Dr. C. Fickert, Ueber die Zeichn. der Gatt. Ornithoptera, p. 722, ♂ fig. 2, taf. 21; ♀ fig. 3, taf. 21.

With the exception of *Schoenbergia Paradisea* of Pagenstecher and of the author, this species is one of the most remarkable and beautiful of all the glorious group of the Ornithoptera—the ♂ being most conspicuous by its long narrow upper, and the curiously incised hind, wing, as well as in the arrangement of the veins of the primaries, and of the sericeous ♂ sexual brand or stigma. During the years extending from 1856, (when Gray described the ♀,) to 1887, the only example known to us was the single type ♀ in the British Museum. Up to the latter year no one knew what the ♂ was like, and no surprise would have been caused if it had been found to be De Hann's remarkable species *O. Tilhonus*, of which only one ♂ (the type) at that time was known to exist in the Leyden Museum. As will be observed in another part of this work, the latter species is not really related to *Victoriæ*, and must form a part of the genus of which *Paradisea* is the type. The unique example in the British Museum known to Gray was not in the most perfect condition, having been killed by a charge of small shot, because of the impossibility of getting it in any other way, as Macgillivray explained, its flight being so elevated and rapid. John Macgillivray, the discoverer of the ♀ sailed in H.M. ss. Rattlesnake and Herald. The former vessel did not touch at any of the Solomon Islands, but the Herald was there in 1854-5. Mr. Salvin, having examined the chart prepared by Captain Denham of the route pursued by the Herald, found that the vessel touched at Wanderer Bay on the South coast of Guadalcanar, and at Makerer on the South coast of San Cristoval, but did not visit the Island of Maleita; therefore, as no Ornithoptera had been found at San Cristoval, he came to the conclusion that it was a practical certainty that the type ♀ of *Victoriæ* had been found at Wanderer Bay, Guadalcanar. Since then the North side of the island has been visited by Mr. Woodford, who also collected in some other localities of the Solomon group, including the Island of Maleita, and collected a considerable series of the ♂ ♂ and a still larger number of ♀ ♀ of this species in that locality, and also at Florida Island; but his first series of the *Ætheoptera* were taken at Wanderer Bay, Maleita, and these proved to be, as Mr. Salvin found, specifically distinct from *Victoriæ*—though the ♀ ♀ did not appear to differ so much from those of Guadalcanar.

♀. Described by G. R. Gray: "General colour glossy bronze black, with the two outer rows of irregular-sized spots of pure white, while those at the base of the fore wings are rich king-yellow, but partly pure white outerly; the anterior margin of the secondary wings narrowly bordered with king-yellow. The under surface like the

upper; but the anterior margin of the secondary wings broadly bordered, and some of the spots tinged with rich king-yellow. The head and thorax pure black; the body ochraceous yellow above, and black along the middle beneath."

♂. Described by Salvin. "Similar to *O. Regina*, but wings of ♂ broader; the sub-apical spot of the primaries smaller and divided into 3 parts by the nervules, and the green of the base of the wings more restricted. The secondaries are almost suffused with the green, except the inner and outer margins; on the distal half are a few black scales, where, in *Regina*, the wings are chiefly black; beneath, the discal green portions of the primaries are broken up by a series of broad black lunules, of which there are only two in *Regina*, and there is a black spot between the sub-costal and its 4th branch."

"Cell of the Primaries wide towards its distal end, the middle upper discocellular nervules very long; lower discocellular also long, but ranged in line with the sections of the median as in true Papilios; the 2nd and 3rd sections of the median, especially the latter, were very short, so that the short median branches and the median itself, beyond the cell, lay very close together. The cell of the secondaries was very long and narrow, though normal in the ♀."

Mr. Salvin's description which follows evidently applies to *Regina* though intended at the time for *Victoriæ*.

"Wings deep black; primaries, except the costa, have a large patch of golden green, the outer margin of which is irregular and ill-defined, and reaches to within a quarter of an inch of the end of the cell; towards the apex is a large sub-triangular golden patch; parallel to the inner margin and near the anal angle is an elongated stigma, similar to that of *Priamus* and its allies. Secondaries, almost from costal margin to beyond the cell, are rich golden green; the distal part of the cell is black, though the nervures closing it are very green; there are also 3 contiguous sub-marginal golden-green spots, whereof the 2 nearest the anal angle have a large central patch of golden yellow. Beneath, the wings are shining golden green, with nervures, margins, and a large sub-triangular patch over the end of the cell of the primaries, a series of sub-marginal spots at the end of each secondary nervure, and 2 lunate spots on either side of the lower radial of the primaries black.

"Antennæ and prothorax black; abdomen ochraceous

grey, with a double row of spots on either side, and a central median line black.

"Primaries narrow, with hardly any perceptible anal angle, the outer and inner margins meeting in a continuous regular curve. The Secondaries are elongated and narrow, and the inner margin deeply incised; the elongated hairs of the inner margin are pale yellow.

"Larva (half grown) dark brown; spines carmine; urticating process pale yellow. The head bears 4 spines (2 long and 2 short). The 1st and 2nd segments 8 each, the 3rd to the 5th 6 each, the 6th to the 11th 4 each, the 12th 2 [Woodford's notes]."

In addition to these descriptions, I add the following notes descriptive of examples in Mr. H. Grose-Smith's museum, figures of which will be found on the plates devoted to this species.

♂. The subapical patch of the primaries smaller than usual, and divided by 2 stout black nervules, golden opposite the light, a rich deep green obliquely against the light. The green of all the wings a deeper suffused green, especially towards the outer and anterior margins of the secondaries. A sub-marginal green-golden band in the secondaries extending from the anal angle to the 1st subcostal nervule, and divided by the intervening nervules into 5 confluent patches, of which the 3 central contain golden spots. Length of costa 70 mms. Plate 21a, figs. 1, 2.

♀. Marks in the discoidal cell of the primaries occupy not quite half its area, and broadly divided by the black of the wings. The basal half is a rich yellow, somewhat indented, and rendered irregular in outline by yellow atoms; the central cellular half is creamy white, irregularly indented, not quite reaching the subcostal nervure; all the other marks of each wing about the same as in other examples, except the subcostal hastate yellow patch, which extends only half way from the anterior angle towards the base, and contains a large sub-orbicular black spot. Underside of secondaries with the precostal or internal cell, the greater portion of the costal margin, and a small area of the discoidal cell at the base, yellow; no discal white spot in the space between the 1st and 2nd branches of the median vein of the upper wing on either surface, where there usually is a rather large mark; and on each surface of the same wing is a small white discal spot outside the 3rd median branch, where usually no spot is found; 3 other small white spots on the upper parts of the upper surface of the primaries, one in each neural space. Length of costa 101 mms. [Plate 22a, Figs. 1, 2.]

♂. Primaries intensely black; basal portion of wing to 2-3rds of the cell a rich veronese green; secondaries with the same quality of green—golden green of wonderful intensity if viewed opposite the light, but obliquely against the light shot with purple reflections, and fiery orange on the under wing. The subapical patch intensely golden when viewed opposite the light, and shaded into golden or veronese green in other positions and lights, much larger too than in the ♂ cited above; the green outside the internal nervure becomes in some lights nearly as golden as the subapical patch. The discal portion of the lower wings with groups of black atoms, whereof the most extensive is situated between the 3rd and 2nd median branches, causing the lower part of this space to be

almost entirely black and to unite with the black of the exterior margin; the submarginal golden-green band of the lower wings extends over the same space as in the ♂ cited above, but two of the enclosed quadrate spots are larger, and the third is very small; abdominal fold lucent grey-brown.

Abdomen, brownish ochraceous white with yellow anal segment, and streaky spots on each side of 3 of the upper segments; 3 segments near the base of abdomen darker than the rest of the body. Underside of wings golden green, intensely golden in some lights, like a rich silk.

Length of costa 76 mms. [Pl. 21a, Figs. 3, 4.]

♀. The white patch of the discoidal cell of the primaries occupies rather more than 2-3rds of the cell from the base, is suffused with yellow at and from the base, graduating into the creamy white, and contains a moderately long cuneiform black mark midway, nearly close to the subcostal nervure; on the under surface this latter mark is absent, the light patch is almost entirely yellow, and contains a few black spots; the space on the upper surface bounded by the internal and part of the submedian nervures from the base is yellow, with yellow atoms below the internal, and a line above the submedian touching the median nervure, of the same colour; these marks absent on the under surface. Secondaries above with the anterior margin to the base and within the precostal, and a small basal portion of the cell yellow, the cell modified by black atoms: beneath a corresponding area of the same pure colour, producing a very broad and conspicuous mass of yellow, with the whole of the remainder of the base of the wing sprinkled with yellow atoms; the white spots and marks of all the wings of the upper surface are rendered ochraceous yellow on the underside of the primaries, and nearly entirely yellow or partially tinged on the secondaries. Some lines of yellow atoms also along the anterior veins of the primaries.

Thorax, head, and antennæ black; abdomen grey ochraceous white, beneath yellow, with black subdorsal.

Length of costa 100 mms.; of posterior margin 73 mms.; of anterior margin 51 mms.; width of wing 55 mms.; of hind wing, costa 67 mms.; length of wing 75 and width 47 mms. Length of abdomen 41 mms.; of antennæ 37 mms.; of thorax with head 26 mms.

Length of legs {	1st pair—femur, 12; tibia, 11; tarsi, 12 mms.
2nd " "	" " 15; " 14; " 19 "
3rd " "	" " 14; " 16; " 19 "

See plate 22a, fig. 3, and pl. 22b, fig. 1.

♀. Wings greyish brown, white marks somewhat warm ashy-white; very little pale yellow in the primary discoidal cell; the same on the subcostal patch near the base; yellow of the subcostal mark of the secondaries very pale; under surface the same, but with more and intense yellow in the cell; a spot between 2nd and 3rd subcostal nervules formed by yellow atoms, also a few atoms of the same colour between the 1st and 2nd. Hind wing with a yellow patch of scales on the brown at the base, and around the precostal and base of the median nervure in the cell; a yellow mark between the costal and subcostal, next below partially yellow, next 3 white, the next pale yellow, and the abdominal margin more yellow—

the lowest part being pointed, with yellow scales on the brown.

Abdomen ashy-grey white, laterally pale yellow, anal tuft reddish ochraceous brown [the brown of the under surface of the wings is warm silky rufous].

Length of costa 72 mms. [See plate 22a, figs. 4, 5.]

♂. The black area of the primaries within the discoidal cell, outside the median for a short and varying distance, and around the stigmatic brand, is very lucent, and according as the light is directed upon it exhibits the richest tints of opalescent blue-green, purple, salmon, and violet, a scheme of unobtrusive beauty rarely to be equalled among the lepidoptera;* the black atoms in the discal spaces of the secondaries, the lower part of the cell, and the abdominal margin are more densely applied, so that the abdominal margin is almost quite black; only 4 contiguous green-golden submarginal spots, three with golden centres. On the under surfaces all the wings are intensely silky greenish golden viewed opposite the light, with 3 submarginal brownish golden spots on the secondaries, and the abdominal marginal area a glowing golden yellow undiluted by green.

Length of costa 77 mms. [See Pl. 21b, figs. 1, 2.]

Habitat of all the above, Guadalcanar, Solomon Islands.

I am indebted to Mr. Henry Grose-Smith, the possessor of a magnificent collection of Rhopalocerous Lepidoptera rich in novelties, which he is constantly communicating to the world in his valuable "Rhopalocera Exotica," for the free use of the examples from which all these and other drawings and descriptions have been made, and I have much pleasure in specially dedicating these plates to him, as a slight acknowledgment of his kindness in trusting such valuable treasures away from his cabinet, for the assistance of a brother worker and the good of science.

The type of the ♀ of this species, which is in the British Museum, although the wings are considerably perforated, in consequence of its having been shot, as the only means of securing the insect, is nevertheless in a sufficiently good condition for reference or study. While there are very few important differences between the markings of this and other examples since captured, we may regard it as the best of typical representatives in those markings. The light discocellular patch of the upper wings, which varies so much in the different examples of the species and also those of *Regina*, may be considered normal in design, as it commences at the base and extends uninterruptedly along fully 2-3rds of the length of the cell, is rather yellow at the basal end, becoming more buff white as it nears the distal end, and is excised almost into an arch from the median nervure obliquely transverse.

In a series of examples studied together we should observe as many variations from the completeness and extent of this patch as there were specimens. For example:—

(a). The light area is yellower from the base, with no lower excision, and only a small cuneiform spot above. [Pl. 22b, fig. 1.]

(b). On the underside the discoidal patch is considerably excised above, and a number of yellow atoms are sprinkled over the remaining black area of the cell. [Pl. 22a, fig. 3.]

(c). The patch on the upper side of the wing in the cell is divided broadly and transversely by black—the outer portion is the least extensive, and does not quite reach to the subcostal nervure, while the basal portion is a rich yellow, and is bounded above and below by the subcostal and median nervures—a few yellow atoms tending to link the two patches. [Pl. 22a, fig. 1.]

(d). The discocellular patch divided obliquely transverse, being only faintly united at the top by thin lines of yellow atoms; a part of the basal yellow area obliquely removed by the encroachment of the black; the outer white portion irregular in outline, and nearly separated about midway. [Pl. 22c, fig. 1.]

(e). Light patch of the cell reaching nearly 4-5ths of its length from the base—the basal portion long, and narrowing to a point near the 2nd or outer division which is obliquely transverse, irregular in outline, and much larger in proportion; it is also quite white, as are all the markings of the upper wing, except slightly at the base, where it is yellowish. In the author's museum. [See pl. 22c, fig. 2.]

(f). The discocellular patch 2-3rds of length of cell—the basal portion much smaller, and separated from the discal part by a dark area about 1-4th the length of the cell—the distal marks being very narrow, obliquely transverse, and irregularly sinuate on both sides; also white. [Author's coll. Pl. 22c, fig. 3.]

(g). A similar arrangement—the basal and distal divisions being nearer together, and each slightly larger. [Pl. 22c, fig. 4 In the author's coll.]

All these observations except "(b)" refer to the upper surface of the primary wings.

On the under surface of the secondaries the following variations may be observed.

(a). The anterior margin and subcostal area with the base of the discoidal cell entirely yellow. [Pl. 22a, fig. 3.]

* It may be unscientific, but I cannot refrain in this place from expressing my admiration for the evidence which such a beautiful arrangement affords the reverential student of the existence and immanent activity of a Divine intelligence in the order of creation. If the stigmatic brand is to be rendered conspicuous, seeing that its colour is only slightly blacker than the blackest portion of the wing, and that it is black placed on black of nearly the same intensity, it will be evident that some method must be adopted in order that it may not be lost to sight; hence a Divine wisdom and skill has adopted the method described in the text, and with that love of beauty which the Divine artist incessantly manifests, a wonderful loveliness is allied to the plan of utility, and two purposes served by the same means. I fully and unreservedly accept the laws of evolution as the chief methods by which the wonders of the universe have been brought to their present glory, but in the working of these we may be certain that the mind of our God, Creator, and Father is the

only efficient cause, and that every result in creation has its origin in the infinite depths of His will. How then can we help trusting and loving Him, and admiring His works? It is easy to a rightly-constituted mind to find Teleology and Evolution quite in harmony with each other; and while we shall ultimately be satisfied that the dominion of *Law* extends throughout all the realms of the Cosmos, and the mental and the spiritual infinitudes from eternity to eternity, we shall know that in Him we have the law-giver, and the executor of that law. Referring again to the device of the stigmatic brand, some examples of *O. (Priamoptera) Urvilliana* have arrived in England in which the stigmatic brand is rendered more conspicuous by its being semi-diaphanous, so that when in flight the light is transmitted through the wing from the bright colour of the underside, and the stigmatic brand therefore glows with a soft transmitted light! A specimen is in Mr. Rothschild's collection

(b). The anterior margin from the base and the base of of the cell, all yellow, the subcostal yellow area is separated by a black space equal to nearly 1-3rd of the interior marginal length—the outer yellow division being sharply acuminate towards the apical end, and enclosing a large black spot. [Pl. 22a, fig. 2.]

(c). Character of the discocellular patch similar, but the outer division does not enclose a black spot. [Pl. 22a, fig. 5.]

(d). The yellow area comprises the basal part of the anterior margin, the subcostal space almost to the median nervure and its 1st branch nearly to the apical angle, and a small basal portion of the cell, but the subcostal yellow is nearly divided by a very consider-

able subarcuate area; and the cell of the under surface of the upper wings contains one small basal yellow mark, and 3 variously outlined marks on the distal end, the superior one being broadly separated from the two larger or inferior. [Pl. 22c, fig. 5. In the museum of the author.]

(e). Anterior, basal, and subcostal yellow mark on lower wings similar in extent but more irregular in outline, the black separating space complete, but not arched. [Pl. 22c, fig. 6. In museum of the author.]

(f). In the British Museum type of the ♀ on the underside of the secondaries with a large black spot nearest to the precostal nervure. Length of costa of primaries 120 mms.

ÆTHEOPTERA REGINÆ.

- Ornithoptera Victoriae**, ♂, Salvin and Godman, Proc. Zool. Soc., 1887, page 190.
 " " ♂, H. Grose-Smith, Annals and Mag. Nat. Hist., 1887, Vol. xix, p. 445;
 " " ♂, H. Grose-Smith, Rhop. Exot., Ornithoptera, pl. i., ♂ and ♀ (*nec* G. R. Gray).
Ornithoptera Reginæ, ♂ and ♀, O. Salvin, Proc. Zool. Soc., 1888, Vol. xx., p. 117.
 " " Dr. C. Fickert, Ueber die Zeichnungsverhältnisse der Gattung Ornithoptera, p. 723, ♀ T. xxi., f. 4.

It seemed, *primâ facie*, unadvisable to give a distinct specific name to the Maleita form of what was previously regarded as only a variety of *Victoriae*; for although the subapical triangulate or golden patch of the primary wing is much larger than in its cousin from Guadalcanar, the other differences were apparently so slight that it was difficult to regard the two forms as specifically distinct. But a close study of the two species by the aid of careful detail drawings, and of a fine pair of *Reginæ* recently acquired by the Hon. Walter Rothschild, and kindly placed at my service, convinces me that Mr. Salvin was quite right in raising this form to specific rank. It is, of course, to be regretted that we are not able to avail ourselves of more material to work with.

In the present case it would be interesting and instructive to have an opportunity of studying and comparing a large series of the males of *Reginæ* with those of *Victoriae*, especially as there are considerable differences between the type and the example in Mr. H. Grose-Smith's collection; and a comparison of the latter with that from Fiji exhibits still further differences, especially in the size and character of the sub-apical golden patch, and in the golden marks on the secondaries of the ♂, as will be evident by a reference to the figures given in the plates illustrating this article, and in observations later on.

The discovery of this species in the Fiji Islands is a remarkable fact, as it is difficult to understand why such a prominent and beautiful species should so long have remained undetected, or unnoticed, even by ordinary persons, especially as the chief Islands, at any rate, have been partially examined by several great Naturalists, and should be fairly well known to Europeans by this time. Berthold Seemann, the illustrious author of the *Flora Vitiensis*, might have seen this species in flight if it had only appeared occasionally; and although his interest would be almost exclusively occupied with the flora, we may suppose that such an observer would, if he had seen it, have made some reference to so splendid an insect. Dr. Graëfe, of Switzerland, as a Zoological collector, should also have noticed it if it were only ordinarily scarce; however, as these insects fly high and are perhaps very local, chiefly confined to the dense forests where it is difficult to penetrate, a long time might elapse before it would be seen even by accident. In Seemann's time a great part of Viti, the most important island of the group, remained unknown to naturalists: little more than the coasts of the larger islands had been skimmed, and the interior of Viti Levu, and its numerous peaks and mountain ridges still offered a rich field for discovery. Many of these points were at the

time inaccessible, owing to the savage nature of the inhabitants. Even now such work would entail considerable fatigue and expense; and it might then be a long time before this species would be met with, if, as is probable, it were very local in its habits.

The circumstances under which Mr. Rothschild acquired possession of his Fijian examples seem to leave no doubt that they came from the locality indicated, especially as some years ago, at the sale of the Matthew's Collection, Mr. Rothschild tells me he noticed a ♀ of this species, a worn specimen, with a Fiji label on it, which at the time he regarded as a mistake.

The great distance between the Fijian and Solomon or Vitian groups of islands is of the deepest interest. The Solomon Islands extend from N.W. to S.E., between 5° and 10° 50' of south longitudes, and between 154° 35' and 162° 25' of east longitudes—the Fiji Islands between 10° 47' and 15° 47' south latitudes, and 180° 81' west and 176° 50' east longitudes, a very important difference of geographical position. We should much more readily have expected this species to be found in some of the New Hebrides group, as they are in a fairly direct line from the Solomons curving westward; and though the nearly central islet of the group, Efata, is almost exactly in the same latitude as Viti Levu of the Fijis, it is much nearer to Maleita, the apparent metropolis of *Reginæ*, than is Fiji, by several degrees of longitude; moreover, a small group of islands, the Santa Cruz cluster, and many other small islets intervene in a direct line S.W., between the two localities. The specimens therefore were unlikely to be carried over so great a distance by winds, though they might have come in such a manner from the New Hebrides, if they inhabit that group. Possibly they may yet be found in those islands, or in some of the small islets extending S. Eastwards from Santa Cruz.

The Viti group, occupying a superficial area 8 times larger than that of the Ionian Islands, according to the calculations of Dr. Petermann, consists of over 230 members large and small—Vanua, Levu, Viti Levu, Kadavu, and Taviuni being the largest, and Rabe, Koro, Ovalau Vatoa and others belonging to the secondary group, in addition to two or three constellations of still smaller islets. There is very little level or low lying ground in these islands—it is nearly all undulated: the larger are hilly, and the largest have peaks 4,000 feet high. Seemann tells us that "the weather side of the islands teem with a dense mass of vegetation, huge trees, innumerable creepers, and epiphytal plants;" that "hardly ever a break

occurs in the green mantle spread over hill and dale except where effected by artificial means. Rain and moisture are plentiful, adding ever fresh vigour to, and keeping up the exuberant growth of trees, shrubs, and herbs."

In such a country we can understand then how even such fine insects as the ♂ and ♀ of *Æ. Regina* could for a long period be concealed from the most observant naturalist."

As Woodford tells us that *Victoria*, and *Urvilliana* are very fond of frequenting the sweet smelling flowers of *cerbera odollam** (closely allied to the Oleander, and similar in aspect), and common on the sea shores of India, Ceylon, Malayana, and N. Australia, throughout Polynesia, and as far east as Pitcairn Island; and as the plant is common in the Solomon Islands, and at least 7 species are found in the Fiji group, it is a wonder that *Regina*, even if living in the interior, had not yet been attracted to the neighbourhood of these plants.

The following are Salvin's diagnoses of this species:—

"♂. Wings deep black; primaries, except the costa, have a large patch of golden green, the outer margin of which is irregular and ill-defined, and reaches to within a quarter of an inch of the end of the cell; towards the apex is a large subtriangular golden patch; parallel to the inner margin and near the anal angle is an elongated stigma similar to that of *O. Priamus* and its allies. The secondaries, almost from the costal margin to beyond the cell, are rich golden green, the distal part of the cell being black, though the nervures closing it are green. There are three contiguous submarginal golden green spots, whereof the two nearest the anal angle have a large central patch of golden yellow. Beneath, the wings are shining golden green, with the nervures, margins, a large subtriangular patch over the end of the cell of the primaries, a series of submarginal spots at the end of each secondary nervure, and two lunate spots on either side of the lower radial of the primaries black.

"The antennæ and prothorax are black; the abdomen ochraceous grey, with a double row of spots on either side, and a ventral median line black.

"The primaries are narrow, with hardly any perceptible anal angle, the outer and inner margins meeting in a continuous regular curve. The secondaries are elongated and narrow, and the inner margin deeply incised; the elongated hairs of the inner margin are pale yellow.

"♀. Like that of *Victoria*. The submarginal spots on both wings, especially those of the secondaries, being apparently rather larger, rounder, and not so lunate."

Habitat: Maleita, Solomon Islands.

The examples of this form appear to have preceded those of *Victoria* in Messrs. Godman and Salvin's collec-

tion, and as may be seen were regarded by those gentlemen and by Mr. H. Grose-Smith as representatives of *Victoria*.

♂. In coll. of Mr. H. Grose-Smith; also figured by him in his *Rhopalocera Exotica*, pl. 1.* A reference to my figure will give accurate information of the superficial appearance of this remarkable insect. The subapical green patch is nearly 2-3rds larger than in any example of *Æ. Victoria*, and is almost or quite connected with the larger area of green which extends from the base to within nearly 4-5ths of the cell, and all the space below the median vein inside the stigmatic brand to the inner margin, by a line of green atom, between the 3rd and 4th subcostal nervules. In the secondaries the black atoms commence at about half-way from the base within the discoidal cell, becoming denser till as they reach the end of the cell the black is almost solid; the nearly uniform black of the disc is separated from the black of the cell by the broad green through which the veins proceed, and also by the three median branches which are margined with green; a number of scattered green atoms are seen in this black; the contiguous submarginal golden green spots are 3 in number, they are 4 in *Victoria* (see fig. 1, pl. 21A), are smaller than in *Victoria*, and the two nearest the anal angle with proportionately smaller golden centres. On the under surface of the secondaries, the area of the abdominal margin within the submedian nervure is a fiery golden green.

I have also thought it wise to add below a description of the interesting pair from Fiji in the museum of the Hon. Walter Rothschild.

♂. Primaries with the subapical green mark not quite so large as in Salvin and Godman, and H. Grose-Smith's examples, but much larger than in *Victoria*; viewed obliquely against the light a deep golden green, opposite the light intensely golden, with congeries of green atoms below it; the other large green patch from the base occupies 5-6ths of the cell, and is bluish green; very golden in some lights, especially just above and below the submedian nervure. Secondaries: the green area is a rich blue green, but golden opposite the light, and occupies the spaces between the costal and discoidal veins and the two branches of the latter, filling the whole of the cell, and encroaching on all parts of the disc without, but dusted with black atoms so intensely at the distal end of the cell as to graduate almost to a dense black; beyond this the disc is quite black, with 3 submarginal golden green marks, each enclosing a golden lemon spot—of these the 1st from the anal angle is sub-diagonal, with a quadrate gold spot, the 2nd is lenticular, with a large golden ovoid centre, and the 3rd diagonal with a minute golden spot; all these marks are more sharply divided from the black than in any other examples of the two species I have seen.

Head and thorax black; eyes brown black; abdomen ochraceous grey—the lower segments pale yellow; subdorsal: anal tuft brown ochre; the penultimate segment of the abdomen cushioned with brown lemon scales.

Expanse of costa of primaries 76 mms., hind margin 51, inner margin 33, and width of wing 31 mms.; of secondaries costa 40, width of wing 30, and length 56 mms. Length of abdomen 35, of thorax with head 19 mms.

*According to Berthold Seemann the genus *Cerbera*, Linn., is synonymous with *Thavalia*, and what is now called *Cerbera* ought to be named *Odollam*, Rheede. The species placed by modern authors under *Cerbera* have nothing in common with the two typical species of that genus. The genus *Cerbera* is placed by Seemann fourth in the order APOCYNÆ. All the genera of Polynesian Apocynæ, except one, *BICORONA*, are found in the Viti Islands. The seeds of this species will bear a long immersion in sea water, being very tenacious of the vital principle; and is supposed to be one of the earliest settlers on Coral islands.

*Under the name of *Victoria*.

♀. All the white markings of the upper surface of the wings much larger and bolder than in *Victoria*, or in either the examples of this species named above; also much more creamy coloured, or with more yellow as the case may be; the corresponding dots of white in Mr. Grose-Smith's example are replaced in this with large marks. Under surfaces with more yellow; the white occupies more of the cell of the primaries than in the Godman-Salvin example and type.

Abdomen: anal tuft deep ochraceous brown, the penultimate segment on the underside cushioned with brown lemon, or golden brown scales.

Primaries: length of costa 107, hind margin 70, interior margin 58, greatest width of wing 58 mms.; secondaries, width of wing 45, length 80 mms.; of abdomen or antennæ 39, of thorax with head 31 mms.; length of costa 80 mms.; of ♀ 104 mms. The legs of both sexes were absent from the specimens.

Hab. Fiji Islands.

♂. In Mr. H. Grose-Smith's collection.

The legs of the ♂ are imperfect.

Length of legs of the ♀	{	1st pair, femur 15; tibia	;	tarsi	
		2nd " " 15; " 15; "		19 mms.	
		3rd " " 14; " 14; "			

Habitat: North West Bay, Maleita, Solomon Islands.

Mr. Salvin points out that the differences obtaining between the males of the two species, such as they are, go to prove that the productions of Guadalcanar and Maleita are modifications of one another. It will be seen by reference to a map which will be found in another part of this work that the two islands are almost parallel to each other, Guadalcanar being the most westward. The Fiji examples, contrary to what might have been anticipated exhibit a smaller amount of modification.

Larva of *Æ. Regina* probably like that of *Æ. Victoria*, Ova nearly spherical, surface finely rugose, like that of an orange; diameter 4 mms. (Salvin).

The type of each sex is in the museum of Messrs. Godman and Salvin; the co-types in that of Mr. H. Grose-Smith; and the Fiji co-types in the museum of the Hon. Walter Rothschild. I gladly acknowledge my indebtedness to those gentlemen for the opportunity of examining and figuring these specimens; and to the two latter for the loan of such examples as I needed with the same unrestricted custodianship as if they were my own. Also 1 ♂ and 3 ♀ in the collection of M. Oberthür, of Rennes, France.

The caudal, or anal extremity, in its outline both dorsal and subdorsal differs very considerably in the species of this genus from its counterparts in the other genera of the Ornithoptera. Here we have a member which, when considered geometrically, would represent very nearly an equilateral triangle with the point of each angle cut off and curved. The left and right points are emphasized by an elongated black mark; the central portion above from the articulation is a black subtriangulate mark extending half way down, flowing into a narrow line of black, which again broadens slightly as it continues round under, and strongly marks out the exterior structure of the anal valves. The measurement of these beautifully formed valves would, if folded back and rendered flat, be as much as 18 mms., or nearly 3-4ths of an inch in width; as the width of the anal segment above it, if treated in the same manner would only be about 14 mms., it will be seen that its width is much greater—in fact greater than any other portion of the abdomen. The whole form of the abdomen then is quite different from that of the ♀ of this species. It goes without saying also that the same observations apply to the body of *Æ. Victoria*, the type of the genus. In the genus *TROGONOPTERA* the abdomen appears to commence at its junction with the metathorax, with a breadth nearly equal to what it will be when the caudal extremity is reached, the intermediate articulations varying little, or only being slightly narrower midway—the valves being somewhat carinated, small, and nearly circular, and without any visible distinction from the rest of the body: the whole abdomen also is very dark, as may be seen by reference to the plates devoted to the species of that genus.

In the genus *POMPEOPTERA* we have the anal valves with the dorsal side cut away obliquely, with strongly projecting terminal points, so that they cross each other when *in situ*; the caudal extremity is smaller and less strongly marked off from the anal segment above it, into which it seems to graduate, and the whole width of the body along its entire length varies little: the body and caudal extremity are also light coloured, or yellow and pure white. This observation applies slightly to the *amphrysus* group, for in other species of the genus some are black or dark coloured as in *TROGONOPTERA*, while a series of gradations in the remaining species closely links them with that genus. In *ORNITHOPTERA*, the caudal extremity is much larger, though not so large relatively as in *ÆTHEOPTERA*, generally an uniform rich yellow—but not quite so brilliant as the rest of the body; it is rotundo-triangular in outline, with the extremities of the angles cut off similarly to those of *ÆTHEOPTERA*; but it is not nearly so prominently distinguished at its basal part for size as in that genus.

The special form and character of the caudal extremity of the Acreeid Ornithoptera, *D. Antimachus* and *Zalmoxis* will be treated of in the section devoted to that genus.

ADDENDA TO PRECEDING PAGES.

[From Pages 28 to 46.]

O. ARUANA.

O. Priamus, V. Arruana, Oberthür, "Ann. Mus. Civ., Genova XV.," p. 46, f. n. 1, (1880) ♂ ♀.

" " Ribbe, "Iris III.," p. 39, (1890) Aru Islands (Larva and Pupæ), ♂ ♀.

" V. Arruana, Oberthür, "Et. d'Ent." IV., p. 27, sub. n. 1, (1879) N. Guinea and Aru Islands. ♂ ♀.

Ornithoptera Arruana, var. *Valentina*, Vuillot, "Bull. Soc. Ent., France," p. 124, (1892) Port Moresby. ♂ ♀.

1 ♀. Anterior wing cell, with the light mark very large and pure; all other marks also large. The spots and marks of the under surface always vary very much in size.

The following are contained in the Tring Museum:—One ♂ with only 1 black subdiscal spot; 2 ♂ with 4; 4 ♂ with 5; 1 ♂ with 3 brown spots, three of them with yellow centres; under surface of ant. wing with 2-3rds of the cell green; a green stripe parallel with the subcostal nervure, and 3-4ths its length; the disc nearly entirely green, except a slight black patch between the 4th and 5th subcostal branches; veins only expressed in black; outer margin narrowly black. Posterior wing green, with the veins feebly shown; the golden mark between the costal and subcostal veins ovate elongate; 4 pale golden-yellow submarginal spots, each smaller than the one above; the submedian space ochraceous golden; and 2 small black spots between the 1st and 3rd veins from the costa. Hab. Aru (Webster). In the Vienna Museum there are 1 ♂, 1 ♀. In the British Museum, 1 ♂ with the green as deep as in the early arrivals of *Pegasus*. From Alu Island; 1 ♂ with no label; 6 ♀—two of these from Duke of York Island; 3 ♀, one of them (Wallace's specimen), varies much in intensity of golden green on the under side; 1 ♀ large example, probably from Duke of York Island.

O. EUMÆUS.

In the Staüdinger Coll., 1 ♂, Waigeu; In the Tring Museum, 3 ♂, 1 ♀.

O. (P.) CRÆSUS.

♀. One with the ant. cell mark divided into 4 narrow elongate stripes, whereof the lowest is the largest; one specimen with 3 ditto; 1 with only 1 narrow division left; 1 with the spot ideally divided into 5 parts, the 1st is the largest, the 2nd, 3rd and 4th are missing, the 5th very small; 1 with no cell mark, the submarginal spots are very small, only 1 small discal mark—the rest being nearly obsolete; 5 examples with the cell marks very irregular in shape, no two alike. In the Tring Museum.

♂. Posterior wing: the golden silky cell spots long in 10 examples; short and narrow, or almost rudimentary, in 5; 7 examples with no black spot; 3 with 1; 2 with 3, the centre one only defined; 1 with 5, nearly equal in size; 2 bordered with a deep green, and the subdiscal golden silky spots well shown; 9 examples in which the anterior wings have no orange discal spots, and 4 with a vein-divided atomic red discal spot. In Tring Museum, which contains 13 or more ♂♂, and more than 9 ♀♀. Many of the ♀♀ are very rich in colour. In the Staüdinger Coll., there are 10 ♂♂, 8 ♀♀, and pupa. In the Vienna Museum, 3 ♂♂, 3 ♀♀. In Brit. Mus., 5 ♂♂, 5 ♀♀,

1 pupa. Mr. H. Grose-Smith's collection contains a fine series:—indeed this species is now well represented in all important collections.

O. (P.) LYDIUS.

In Tring Museum, 2 ♂, 3 ♀. Brit. Mus., 1 ♂, 1 ♀. In Dr. Staüdinger's Coll., 6 ♂, 5 ♀. In the Vienna Museum, 1 ♂, 1 ♀.

O. (P.) URVILLIANA.

The series in the Tring Museum contains the following:—From New Britain 6 ♂, 4 ♀; from New Ireland 8 ♂, 3 ♀; from Duke of York Island 2 ♂, 1 ♀; from Solomon Islands 11 ♂, 15 ♀; also larva and pupa. (This list includes the green var. *Bornemanni*, of Pagenstecher.) Captain Webster (quoted by Mr. Rothschild) says that when the ♂ emerges from the pupa it is green, and gradually assumes the peculiar blue colour; when it is killed too soon after emergence, it assumes the peculiar bluish green or greenish blue which is mentioned by Pagenstecher, a fact that is very suggestive. I noticed that when I relaxed, for setting, a very rich ♂ *Cræsus*, after having been some hours in the relaxing dish, the upper sides of all the wings were absolutely bright sage green.

In the British Museum, 1 ♂, New Hebrides (H.M.S. Ship *Dart*); 1 ♂, 1 ♀, dark form, Guadalcanar; 2 ♂, greenish-violet blue, and 3 ♀ with large anterior wing spots, very light, Aola, Guadalcanar; 1 ♀, violet, Florida Isle, Solomons, 1 ♀, with large light cell spot; 5 ♂, Alu Island, near Shortland Isle, Solomon Group, 3 with a green tinge, 1 violet blue; 3 ♀, one with the ant. wing cell spot indicated by 3 small nebulous blotches on the right wing—the left wing being immaculate; 1 ♀ from Fauro Island, Solomon Group; 2 ♀ examples of melanism: the ant. wing cell of one with only very faint light division marks; in the other almost obsolete, as are all the light marks; 1 ♀ from Savo Island, Solomon Group, greenish in tint; 5 ♂ New Ireland, brown, blue and violet; 1 ♂, New Ireland, with slightly greenish black subdiscal spots on the secondaries; 2 ♀, one with the ant. wing cell immaculate; 1 ♂, New Ireland, very green blue, especially the costal band; 4 ♀♀ very light brown.

In New Britain a number of specimens remain green after emergence from Pupa, and have the appearance of *Poseidon*; the band along the inner margin of the anterior wings is more or less obsolete. The median vein of the same wings is covered with a few green scales only, or is quite black, or has much sparser green scaling on the upper surface of the posterior wing. In the Staüdinger

Coll. there are 3 ♂, 3 ♀ and the Pupa from Shortland Islands, also the green var. *Bornemanni*, New Britain, 3 ♂, 3 ♀. In the Vienna Museum 1 ♂, 1 ♀ labelled *Urvillianus* and 1 Pupa; also 1 ♂, 1 ♀ *Bornemanni*. In my own collection, 4 ♂, 8 ♀ of *Urvilliana* from Duke of York Island and Aru Island.

VAR. BORNEMANNI.

O. Pegasus, v. *Bornemanni*, Pagenstecher, "Jahrb. Nass. Ver. Nat." p. 65, t. 2, f. 2, (♂), (1894) N. Britain.

Troides Priamus Urvillianus, ab. loc. *Bornemanni*, Rothschild, "Novitates Zool., V. II," p. 191, (1895).

♂. In the Rothschild Collection. Anterior wings deep velvet black; the median vein and branches sparsely dusted with green scales; subcostal band and broad submarginal band a dark rich bluish green, beautifully graduated into the black. Posterior wings, the same rich green, dusted from the base with black scales, most densely at their starting point, till they become faint on the discal area; with 3 moderate sized orbicular internervular black spots, and a 4th, the lowest, almost obsolete. Viewed in a slightly oblique position against or opposite the light very blue green; in a line with the eyes and opposite the light, a rich fiery copper-red. All the green of the under surface of both wings a slightly warmer blue green; the dark ground, and black spots of the hind wings (7) nearly as black as above: also shot with coppery reflections; the submedian area from the anal angle half way to the base, orange. Thorax, deep velvety black; longitudinal mark, dark green; abdomen, orange yellow; abdominal fringe, long and burnt sienna red. Length of costa, 80 mms.

Hab. New Britain (Cotton and Webster). Also from Mioko Island (Coral Island), New Lauenburg, Duke of York Group, according to Herr C. Ribbe. [See Pl. 18 in this Vol. A ♀ is also figured in this plate, from the same locality, which is probably the consort of this variety. As a contrast to the above, I give 2 figures of an intensely blue form of *Urvilliana* on the same plate]. New Hanover (Webster), in the Tring Museum.

VAR. CÆLESTIS.

Pap. Urvilliana Cælestis, Rothschild, "Nov. Zool. V." p. 216, n. 1, (1898).

♂. Anterior wings intensely velvety-black—the veins, except the median nervure, almost untraceable in any light; the pupæform band very regular in outline, and a very subdued dark ruddy brown, but almost invisible when viewed obliquely opposite the light; the subcostal band verdâtre blue, with a slightly violet tinge at the base of the right wing (if viewed on a table, with the light coming from the left side, and the insect a little to the left of the observer) the posterior and interior marginal bands warm violet blue with salmon-coloured reflections; the left wing with the subcostal band rosy violet; the posterior and interior bands green verdâtre blue; posterior right wing (in the same position for light) violet blue; left wing green verdâtre blue; the discoidal cells black, and graduated from the distal end by blue irrorations; a discal band of 5 submarginal black spots,

whereof that nearest the anal angle is almost obsolete; all these spots are graduated, and appear to be separated from a ground-work of black that fills up all the internervular spaces of the disc above the spots by a dense irroration of blue atoms, as in the cell; the submedian area is scaled in the same manner; the black marginal band is black, and encroached upon by the blue atoms; and the space above to the black spots is blue without irroration.

The head and thorax are densely velvety-black; the eyes deep castaneous, with delicate golden white outline; the thoracic longitudinal mark greenish-bluish, with violet reflections, metallic in appearance, and very obtrusive; the abdomen is golden orange yellow, with the usual triangular black anal mark; the annuli only faintly expressed, in consequence of the uniform purity of the abdomen.

Undersurface: Anterior wings very black, though a warm brown towards the outer margin; all the spots and marks a rich (slightly greenish) blue opposite—and violet blue against—the light. Posterior wings: the discoidal cell and lower area of the disc blue to blue green: the other internervular spaces above the submarginal band of 7 black spots, green: between the spots and the narrow partially indented black marginal border, green-golden, with a faint suggestion of golden central spots; a small faint golden spot above the black spot just below the subcostal nervure; the abdominal fringe rather long and yellowish-brown. Length of costa, 70 mms.; width of wing, 50 mms.; width of posterior wing, 31 mms.; length, 37 mms.; length of abdomen, 31, of thorax with head 21, and of antennæ 32 mms.

Hab. St. Aignan or Misima (the native name) one of the Islands of The Louisiade Archipelago, situated east of the most southern part of New Guinea, in about 132° 45' East longitude, and about 10° 35' S. latitude. Collected by Mr. Meek—from August to November, 1897.

Drawn and described from Mr. Rothschild's type. [See Pl. 19, figs. 1, 2].

♀. All the wings smoky brown; the lower wings in some lights are seen to be from the base densely hirsute over the brown of the wing; the light marks all rendered very sordid by dark scales; the discal light area of the posterior wings are as usual somewhat ochraceous below the band of black spots; the light fringe lunules are well expressed, the light mark in the anterior wing cell is somewhat different in shape from the usual type, but not sufficiently so to be important. The under surface of all the wings very pure light brown—darker brown towards the outer margin of the anterior wings, and quite black on the outer margin of the posterior wings.

The light marks of all the wings the same in number and shape as above, but pure ochraceous or creamy-white on the anterior wings—the same on the posterior, but lemon yellow below the sub-orbicular discal black spots—these spots are likewise rather larger below than above; the black spot on the inner margin of the left hind wing is more than twice as large as the corresponding spot on the right wing; on the upper side this larger spot is absent or is fused into the general brown of the disc (on the right wing as it then becomes), but is as prominent as on the under surface, or what is now the left

wing. The abdomen dark-greyish ochraceous white, with a longitudinal dark discal stripe from the 1st to the 4th annulus; subdorsum golden yellow, with the usual lateral black dots, and other darker characters; thorax velvety black—the pale greenish golden longitudinal mark very narrow: the pectoral red patches below are extensive, so that nearly the whole underside is clothed with this hirsute red; the eyes deep castaneous brown, underlined as usual.

Length of costa, 77 mms.; greatest width of wing, 54 mms.; width of posterior wing, 34 mms.; length of wing, 51 or 52 mms.; length of abdomen or antennæ, 32, and of thorax with head, 20 mms.

Hab. St. Aignan. Collected by Mr. Meek. Drawn and described from Mr. Rothschild's type. [See Pl. 19, figs. 3, 4].

I have specially described these two examples for the sake of comparison with other varieties of *URVILLIANA*. The student can then form his opinion as to whether this form is sufficiently differentiated from other local examples to merit a distinctive name, or whether its only title to special consideration is its smaller size—the view I am myself compelled to take. It is interesting as having been taken in this locality, but I see no reason why it should not occur in the Louisiade Archipelago, and in other islands intermediate from New Britain and the Solomon's also. I here call attention to the fact that on the upper surface of the posterior wings of the ♀, the discal dark spots in the light area, if viewed in a slightly oblique position against the light will be seen to be pupillated each with a blacker orbicle. This feature occasionally occurs in examples of other species.

I have, since writing the foregoing, seen a number of ♀ specimens, and find an universal stability in the size and shape of the markings of the ant. wing, and in the other light marks also, which I consider fully justifies Mr. Rothschild in giving it a variety name.

Æ. VICTORIÆ.

Ornithoptera Victoria, Haase, "Untersuch. ü. Mim." p. 24, 1893, ♂ ♀.

Troides Victoria, Rothschild, "Entomologist," XXVIII., p. 78 (1895), ♂ ♀, Guadalcánar.

" " "Novitates Zoologicæ," Vol. II., p. 196, n. 6, p. 197.

In the Tring Museum 6 ♂, 8 ♀, Larva and pupa, Guadalcánar. In the Brit. Museum 3 ♂, Guadalcánar. Under surface of one example (posterior wing) with square golden silky submarginal spots; 10 ♀, same locality; 1 ♀ from Wanderer Bay, Guadalcánar (the type). 1 ♂, Florida Island, with the darker marks smaller than usual.

In the author's museum 5 ♀, Guadalcánar. Dr. Staudinger's Coll. 1 ♂, 2 ♀ same locality. Mr. Crowley's Coll. 3 ♀, (?) ♀.

This species has also been taken in Shortland Island, Bougainville Island; and the ♂ was seen in the Rubiana Lagoon by Woodford.

Æ. REGINÆ.

Troides Victoria Regina, Rothschild, "Entomologist," XXVIII., p. 78 (1895).

In the Tring Museum 1 ♂, 3 ♀; British Museum 1 ♂ ex. G. et Salv. Coll. (the type); in the collection of Mr. H. Grose-Smith, ♂; in Staudinger's Coll. 3 ♀.

Æ. REGIS.

Troides Victoria Regis, Rothschild, "Ent. XXVIII." p. 78.

" " "Nov. Zool. II., p. 197.

♂. Ant. wing a rich brown black. The apical patch of the anterior wing almost entirely intense golden orange, slightly shading into green at nearest the margin; this patch is rather larger than in the type *Victoria*, and draws nearer to the green area of the wing than in either *Victoria* or *Regina*; the silky green area from the base occupies rather less than 1-3rd of the wing length, and does not extend upwards above the costal nervure, very golden in the sunlight; part of the cell and disc around the stigmatic brand (which is a light warm brown) is shot with purple, orange red, and opal, which can only be seen glowing over the black when the insect is viewed in the right position for light: when the sunshine falls upon the wings parts of the more elevated surfaces then glow like fire.

Posterior wings a rich bluish green, shading according to the position of the insect into a vivid golden green; this area of green is continuous from the base over the greater part of the wing; the costal margin is narrowly velvet black; the posterior margin has an indented fairly broad band of black, which is continued to the anal angle, and also fills all but a narrow space from the abdominal margin to the median nervure (the green of the wing fills that narrow space); a broad indented golden orange submarginal band contains on the 2 lower internervular spaces a spot of silky golden orange; the green space between the discoidal and 1st median nervules is slightly dusted with black scales; between the 1st and 2nd median nervules heavily dusted, so as to appear nearly solid black in the centre, and between the 2nd and 3rd as heavily up 2-3rds of the space from the golden orange band; when viewed opposite the light the orange band is flaming in intensity, against the light it is a dull blue green.

Underside. Anterior wings, silky brownish black; the greater portion of the discoidal cell, all between the median nervure and where the stigma would be, is a fiery golden orange, as also a transverse, broad and scalloped or indented band which is a continuous part of this golden area right up to the 3rd subcostal nervule; there are also 4 subdiscal internervular greenish orange marks, the first being nearly square and large, the others small or rudimentary. Posterior wings intense glowing golden orange, varying in brilliancy with every change of light, redder towards the outer and abdominal margins. Viewed against the light the whole of the silky orange of both wings becomes golden russet green; but opposite the light it seems almost on fire; the costal margin narrowly velvet black; the 4 submarginal black spots or marks on the ends of the nervules are much larger than in *Victoria*, and a small, deep, golden orange spot is placed between each

of them; between the 2nd subcostal and the 1st median nervules are 2 discal rudimentary black spots; the median and subcostal nervures are black, and all the veins are very conspicuous; the marginal fringe is black.

Thorax, head, and antennæ as in *Victoria*; legs also; the abdomen a very rich delicate pinky buff colour; with a delicate dorsal pink series of markings on 4 of the segments; and lateral black spots; the texture of the abdominal is almost velvety. The base of the abdomen is black; abdomen fringe of hairs short, and burnt sienna in tint.

Length of costa 79, width of wing 34 mms.; greatest length of the hind wing 60, greatest width 32 mms.; length of abdomen 38, of antennæ 36, and of thorax with the head 23 mms.

Hab. Bougainville, Solomon Islands. (Ribbe.) Drawn and described from the type. In the Tring Museum.

♂. In same collection. On the underside of wings in a proper light are suffused with russet pink, especially the posterior wing with submarginal large black square spots.

Hab. Aru Island and Shortland Island, Solomon Archipelago.

♂. Anterior wing: apical golden patch large and shot with green, with a fairly large black rudimentary black spot between the 4th and 5th subcostal branches; green area from the base not very extensive, and shades into bluish from golden with change of light. Underside of all wings golden green.

♂. Anterior wing: apical golden patch longer than in

the type. Posterior wings, the black dustings or scaling is extensive in the internervular spaces.

Hab. Bougainville. In Tring Museum.

Mr. Rothschild's diagnosis of the type is: "Sub-apical patch of f. w. very long, consisting of 2 large spots and a narrow streak or small spot behind the 5th subcostal nervule. The green area of h. w. as in *Victoria* or *Regina*; anterior submarginal yellow spot is obliterated in the type specimen."

♀. "Submarginal spots of either wing much smaller than in *Victoria*, partly obliterated [one white spot on each wing is obliterated on both surfaces]; discal spots and those at the base of fore and hind wings also smaller than in the sub-species: in one ♀ a small black spot within the first (costal) marking of the discal row of black spots of the hind wings."

The basal spots above and below of both wings, the subcostal mark, (with central black spot) and divided rudimentary sub-anal mark, are all yellow on all the wings; the anterior cell mark is divided, and not large—most divided on the under surface, more or less suffused with yellow. Length of costa 91 mms.

Hab. Bougainville Island. (C. Ribbe, 1894) 3 ♂, 1 ♀; Alu, 1 ♂, Webster. In Tring Museum.

The apparently constant facies of the ♀ ♀ of this form render it deserving of a name. The ♀ seems to be a lighter brown than in the other forms.

In the Vienna Museum 1 ♂, 1 ♀. In the Staudinger Coll. 1 ♂, 1 ♀. Bougainville.

SYNOPSIS OF THE PRINCIPAL CHARACTERS OF THE GENERA DRURYA, SCHOENBERGIA
ORNITHOPTERA AND ÆTHEOPTERA CONTAINED IN THIS 1ST VOL.

A.—ANTERIOR WINGS.

1. Costa of anterior wings $2\frac{1}{2}$ times the length of the interior margin. *Drurya Antimachus* ♂, *Schoenbergia Paradisea* ♂.
 - 1a. Costa of anterior wings nearly 2 times the length of the interior margin. *D. Antimachus* ♀, *D. Zalmoxis* ♂.
2. Outer margin of anterior wings strongly concave. *D. Antimachus* ♂ ♀.
 - 2a. Outer margin of anterior wings less concave. *D. Zalmoxis*.
 - 2b. Outer margin of anterior wings sub-convex. *Schoenbergia Paradisea* ♂.
3. Anterior wings elongate and triangulate. The ♂♂ of *Ornithoptera Priamus*, *Cassandra*, *Richmondia*, *Pegasus*, *Poseidon*, *Aruana*, *Eumæus*, *Cræsus*, *Lydius*, and *Urvilliana*.
 - 3a. Anterior wings long and narrow by comparison with the posterior wings. The ♂♂ of *Ætheoptera Victoriae*, *Reginæ*, and *Regia*.
4. The 3rd subcostal nervure emitted close to the apex of the discoidal cell of the anterior wing. *D. Antimachus*, *Zalmoxis*, *Schoenbergia Paradisea*, (and, occasionally) *Ætheoptera Reginæ* ♂♂ ♀♀.
 - 4a. The 3rd subcostal nervure emitted at 3 mm. below the apex of the cell, *Sch. Tithonus* ♂; at 2 mm. ♀; at 4 mm., *Sch. Goliath* ♀; at 5 mm., *O. Priamus* ♂; at 6 mm. *O. Priamus* ♀; at 4 mm. *O. Cassandra* ♂; at 5 mm. the ♀; at 2 mm. *O. Richmondia* ♂, at 3 ♀; at 7 or 8 mm., *O. Pegasus*, and *Poseidon* ♂ ♀; at 4 or 5 mm., *Aruana* ♂ ♀, at 7 mm. *Aruana* var. ♀, *Eumæus* and *Cræsus* ♀; at 6 mm., *Eumæus* and *Cræsus* ♂; also at 3 mm. *Cræsus* ♂; at 6 mm., *Lydius* ♂ ♀, *Urvilliana* ♂ ♀; at 5 or 3 mm., *Æ. Victoriae* and *Reginæ* ♂; at 8, 9, or 10 mm. *Victoriae* and *Reginæ* ♀; and at 2 mm. above the apex of the cell *Victoriae* ♂ ♀.
 - 4b. The 4th and 5th subcostal nervures emitted at 9 or 10 mm. above the apex of the cell, *D. Antimachus* ♂, at 8 ♀; at 6 mm. *D. Zalmoxis*; at 12 mm., *Sch. Paradisea* ♂ ♀; at 4 mm., *Tithonus* ♂, at 6 ♀; at 11 mm., *Goliath*; at 4 mm. *O. Priamus* ♂ ♀; at 3, 4, or 5 mm. *Cassandra* ♂, at 5 to 7 mm. *Cassandra* ♀; at 2 mm., *Richmondia* ♂ ♀; at 1 mm. *Pegasus* ♂, at 3, ♀; also at 3 ♂, and at 6 ♀ var. *Brunnea*); also at 4 *Pegasus* ♂, at 5 or 6, ♀; at 2 mm., *Aruana* ♂, at 6 or 7 ♀; at 1 *Eumæus* ♂, at 2, ♀; at 2 mm., *Cræsus* ♂, and *Lydius* ♂ ♀, also at 4 *Lydius* ♀; at 2 or 3 mm. *Urvilliana* ♂ ♀; at 3, 7, or 9 mm., *Æ. Victoriae* ♂; at 9 or 12, *Reginæ* ♂; at 11, 14, or 18, *Æ. Victoriae* ♂; at 13 and 14, *Reginæ* ♀.
5. Anterior wings rounded. *Sch. Paradisea*, *Tithonus*, and *Goliath* ♀♀.
 - 5a. Outer and inner margin united by a continuous curve to the base, *Æ. Victoriae*, *Reginæ* and *Regia* ♂♂.
 - 5b. Inner margin of wing straight, *Sch. Paradisea*, and *Tithonus* ♂♂.
6. Anterior wings of the ♀ more arcuate (and pointed at the apex) than the ♂. *O. Aruana*, *Eumæus*, *Cræsus*, and *Urvilliana*.
 - 6a. Anterior wings straighter at the costa, and less pointed at the apex. *O. Lydius* and other species of this genus.
7. Anterior wings with no sexual stigmatic or pupæform brand in the ♂. The genera DRURYIA and SCHOENBERGIA.
 - 7a. With a large pupæform stigma. Genus ORNITHOPTERA (and section *Priamoptera*).
 - 7b. With a long, narrow pupæform stigma. Genus ÆTHEOPTERA.
8. Discoidal cell long and narrow. *D. Antimachus* and *Zalmoxis* ♂ ♀: long and conical *Sch. Paradisea* ♂ ♀.
 - 8a. Cell proportionately large. Genus ORNITHOPTERA.
 - 8b. Cell very broad at the distal end, and diminishing to a point at the base. Genus ORNITHOPTERA ♂♂: in the ♀♀ broad, and half the wing length.
9. Basal cell long, and nearly cuneiform. *D. Antimachus* ♂ ♀.
 - 9a. Basal cell very narrow. *Sch. Paradisea*, *Tithonus* ♂ ♀.
 - 9b. Basal cell tetrahedral. *Sch. Goliath*.
 - 9c. Basal cell moderately long and narrow: sometimes tetrahedral or cuneiform. Genus ORNITHOPTERA.
10. Pseudoneura 4 in number, the 3rd and 4th branching halfway from the base. *Antimachus* and *Tithonus* ♂ ♀.
 - 10a. The 3rd branching at 1-4th from the base. *Zalmoxis* ♂.
 - 10b. Pseudoneura 4 in number. All branch off from a basal stem at a short distance, and running fairly parallel. *Paradisea* ♂; in the ♀ arranged in the same way as in the genus ORNITHOPTERA.
 - 10c. Pseudoneura 4 in number: arranged, or branching from each other, differently in different species. ORNITHOPTERA ♂ ♀.
 - 10d. Pseudoneura 4 in number: 1st branch shorter than in the Genera POMPEOPTERA and ÆTHEOPTERA ♂.

- 10c. Apparently 3 or 4, the 2nd branching at a quarter, or lesser distance from the base. Genus *ÆTHEOPTERA* ♀ ♀.

B.—POSTERIOR WINGS.

1. Costa of posterior wings nearly straight. Genus *ÆTHEOPTERA* ♂ ♂.
2. Inner margin of wing at the anal angle deeply incised, Genus *ÆTHEOPTERA* ♂ ♂; much less incised, but more abruptly, Genus *SCHOENBERGIA* ♂ ♂.
3. Without an abdominal fringe. Genus *DRURYA* ♂ ♀.
 - 3a. With a short abdominal fringe. Genera *SCHOENBERGIA*, *ORNITHOPTERA*, and *ÆTHEOPTERA* ♀ ♀.
 - 3b. With moderately long fringe, the ♂ ♂ of the same Genera.
 - 3c. With very long white or brownish-white hairy fringe. Genus *SCHOENBERGIA* ♂ ♂.
4. Discoidal cell elongate and rather narrow (wider midway). *D. Antimachus* ♂ ♀.
 - 4a. Cell irregular in shape. *D. Zalmoxis*.
 - 4b. Cell broad ♂, narrower ♀. *Sch. Paradisea* and *Tithonus*.
 - 4c. Cell very broad at distal end. *Tithonus* ♂.
 - 4d. Cell proportionately large. *Goliath* ♀, and Genus *ORNITHOPTERA*: sometimes the ♂ and sometimes the ♀ being the broadest.
 - 4e. Cell narrow, and nearly 3-4ths of the wing length. Genus *ÆTHEOPTERA* ♂ ♂: less than half the length of wing and less narrow ♀ ♀.
5. Pseudoneura strongly expressed, with 3 branches. Genus *DRURYA*.
 - 5a. Invisible in Genus *SCHOENBERGIA* ♂ ♀, in *ORNITHOPTERA* ♂ ♀ 3 in number.
 - 5b. Pseudoneura 2, the first branching midway of the cell. Genus *ÆTHEOPTERA*.
6. Posterior wings rounded. *D. Zalmoxis* ♂ ♀.
 - 6a. Length of wings $2\frac{1}{2}$ times their width. *Sch. Paradisea* ♂; length $2\frac{1}{3}$ times their width *Tithonus* ♂.
 - 6b. Length of wings nearly 2 times their width. *Æ. Victorix* and *Reginæ* ♂ ♂.
7. With strongly curved narrow caudal prolongation or tail. *Sch. Paradisea* ♂.
8. Wings broad. *D. Antimachus* ♂ ♀.

AA.—ANTERIOR WINGS.

1. The males and females resemble each other in colours and pattern. *D. Antimachus* and *Zalmoxis*.
 - 1a. The sexes unlike in pattern and form in the genera *SCHOENBERGIA*, *ORNITHOPTERA* and *ÆTHEOPTERA*.

BB.—POSTERIOR WINGS.

1. The males and females resemble each other in colours and pattern. *D. Antimachus* and *Zalmoxis*.
 - 1a. Sexes unlike in pattern and form in the genera *SCHOENBERGIA*, *ORNITHOPTERA* and *ÆTHEOPTERA*.

C.

1. Females smaller than the males. Genus *DRURYA*.
 - 1a. ♀ ♀ larger than the ♂ ♂. The genera *SCHOENBERGIA* and *ORNITHOPTERA*.
 - 1b. ♀ ♀ much larger than the ♂ ♂. Genus *ÆTHEOPTERA*.

D.—MALES, COLOURATION.

1. Wings on the upper surface with brick-red and black colours: under surface yellow, black and grey. *D. Antimachus*.
 - 1a. Wings blue-green, or olive-green blue and black above; grey-white, red-brown, brick-red, and black and white beneath. *D. Zalmoxis*.
 - 1b. Golden-green, golden-yellow and black on both surfaces, Genera *SCHOENBERGIA* and *ÆTHEOPTERA*; on the under surface the emerald green is suffused with gold in the genus *ÆTHEOPTERA*.
 - 1c. Golden-green and black on all the wings. *O. Priamus*, *Cassandra*, *Richmondia* (varied in tone), *Pegasus* (darker green), *Poseidon*, *Aruana* (lighter warm silky green).
 - 1d. Golden scarlet, scarlet shot with green, golden yellow or orange, and brown above, and golden dark and green below. *O. Cræsus* and *Lydius*.
 - 1e. Green-blue and black. *O. Eumæus*.
 - 1f. Dark violet-blue and black, greenish-blue or violet, dark lilac-blue and black. *Urvilliana*.

- 1g. Under-surface blue-green, golden-green, gold marginal spots, and black. *Urvilliana*.
- 1h. Sometimes golden-yellow, or brown-black with russet-brown yellow on under-surface. *O. Pegasus*.
- 1i. Under-surfaces dark golden-green and dark-brown. *Poseidon, Eumæus*.
- 1j. Under-surfaces light golden-green and dark brown. *Aruana*.
- 1k. Under-surfaces bluish-green or bluish golden-green, and gold and black sub-marginal and discal spots. *Priamus, Cassandra, Richmondia*.

DD.—FEMALE COLOURATION.

- 2. Wings above with brown or warm-brown, white and grey, or ochraceous markings, and all bearing a strong family resemblance, except *Lydius*, which is Acræoid. The Genera *SCHOENBERGIA* and *ORNITHOPTERA*.
- 2a. Wings on the under-surface with orange, or brown orange, or lemon-yellow posterior submarginal patches. *Sch. Paradisea* and *Tithonus*, *O. Cassandra, Richmondia, Pegasus, Poseidon, Eumæus, Cræsus, Lydius*.
- 2b. Under-surface of posterior wings with greenish-yellow submarginal marks. *Sch. Goliath, O. Priamus, Pegasus, v. Brunnea, Poseidon, Aruana, Urvilliana, Æth. Victoriæ and Reginæ*.
- 3. Anterior wings with the cell immaculate. *O. Priamus* and *Pegasus*, var. *Brunnea*.
- 3a. Cell of anterior wing with white patch (small, or broken up), *Cassandra*; large, *Richmondia, Pegasus, Poseidon, Eumæus*; very large, *Aruana*; reduced to a mere spot, or small, or divided, *Cræsus*; very large, small, divided, or almost obsolete, *Urvilliana*; small and divided, *Goliath*.
- 3b. White filling the whole cell. *Lydius*.
- 3c. White cell patch large and nearly square. *Tithonus*.
- 3d. Large and irregular in form. *Paradisea*.
- 3e. Cell with 2 black marks on red. *Antimachus* ♂ ♀.
- 3f. Cell with one or two large white marks, always commencing at the base, sometimes occupying 3-4ths of the cell area. *Æ. Victoriæ and Reginæ*.

DDD.—MALE COLOURATION AND PATTERNS.

- 1. Anterior wings with subcostal band of green, red, or blue moderately narrow. *O. Priamus, Cassandra, Richmondia, Pegasus, Poseidon, and Aruana*.
- 1a. The subcostal band united with a green discocellular patch. *Pegasus* var.
- 1b. Subcostal band rather broader. *Eumæus, Lydius*.
- 1c. Subcostal band very broad. *Cræsus*.
- 1d. Subcostal band very narrow. *Urvilliana*.
- 2. Anterior wings with moderately large greenish-golden subapical patch, divided by 2 nervures. *Æ. Victoriæ*.
- 2a. With the patch much larger. *Æ. Reginæ*.
- 3. Posterior wings generally with 4 visible black discal spots on upper surface, 6 below. *O. Priamus*.
- 3a. With 3 or 4 above and 6 beneath. *Cassandra*.
- 3b. With 3, 4, 5 or 6 above and 6 beneath. *Richmondia*.
- 3c. With no spots, or 2 nearly obsolete spots above, and 6 below. *Pegasus*.
- 3d. With small spots above, and 6 or 7 below. *Poseidon*.
- 3e. With 3 spots above and 6 below. *Aruana*.
- 3f. With 2 spots above and 6 below. *Eumæus*.
- 3g. With large spots beneath. *Cræsus*.
- 3h. With 4 spots above and 6 below. *Lydius*.
- 3i. With 4 large spots above, and 6 below; 2 very small above, and 6 small below; or 4 elongate above, and 7 beneath. *Urvilliana*.
- 3j. With 2 or 4 atomic black spots above, and 5 elongate spots on the terminals of the veins beneath. *Æ. Victoriæ*.
- 3k. Without spots above, and 5 beneath. *Reginæ*.
- 4. Posterior wings with 3 silky-golden submarginal spots on both surfaces. *Victoriæ, Reginæ*.
- 4a. With a submarginal row of gold spots on the under surface of wings. *Urvilliana*.
- 4b. With 2 spots and a large golden patch divided by the veins on upper surface, *Lydius*; under surface with 3 spots and a large patch, and golden mark at anal angle. *Lydius*.
- 4c. With 6 or 8 golden marks above, and 8 or 9 below. *Cræsus*.
- 4d. With one or two golden dots above, and 6 faint golden spots below. *Aruana*.
- 4e. With 6 golden spots below. *Poseidon*.

- 4f. Without golden spots, or with 2 above, and 4, 5 or 6 below. *Richmondia*.
 4g. With 1 to 3 above, and 1 to 7 below. *Cassandra*.
 4h. With 1, or without above, and 2 or 3 below. *Priamus*.
 4i. With a large area of golden-silky yellow on both surfaces, and a small golden dot. *Sch. Paradisea*.
 4j. With a large area and 3 additional large golden patches on both surfaces. *Tithonus*.

E.—THE ABDOMEN.

1. Light creamy-yellow, with red-brown dorsal longitudinal stripe and brown-red anal segment. *D. Antimachus* ♂ ♀.
 1a. Light orange-yellow: brown-red dorsal stripe extending only from base 2 segments length: with lateral and subdorsal rows of black spots with white centres. *D. Zalmoxis* ♂ ♀.
 1b. Rich golden lemon-yellow, with long dorsal black stripe, wide at summit, and narrowing towards the anal end, divided longitudinally by white lineations, with lateral black dots. *Sch. Paradisea* ♂.
 1c. Creamy grey-white, yellower at the sides, with black dots; subdorsum yellow, with the annulations strongly expressed in black: scarlet and black at the base: anal tuft brownish-ochre. *Paradisea* ♀. With no basal scarlet. *Tithonus* ♀.
 1d. Golden yellow above and below, with light greenish dorsal stripe, lateral large elongate black spots: anal segment triangulate, and divided above by black: curved black marks at the base also. *Tithonus* ♂.
 1e. Reddish grey-white: basal segment brown; lateral black dots. *Goliath* ♀.
 1f. Golden yellow, with faint orange dorsal stripe, lateral black dots, and anal segment with the triangulate black dividing mark. *O. Priamus* ♂, *Cassandra* ♂.
 1g. Light ochraceous grey, or reddish grey (according to whether the wings are melanistic or light red-brown) with lateral black dots, and subdorsal portions of segments strongly defined by black. *O. Priamus* ♀, anal tuft orange brown *Cassandra* ♀.
 1h. Lemon yellow with pale orange dorsal stripe: brown at the sides, and anal segment normal. *Richmondia* ♂.
 1i. Dark grey, yellow at the side with dorsal and lateral row of ovate black spots. *Richmondia* ♀.
 1j. Reddish golden yellow, or golden yellow with reddish dorsal blotches. *Pegasus* ♂.
 1k. Greenish grey, creamy towards the anal end, with basal brown, and 3 central dorsal brown spots; anal tuft brown ochre. *Pegasus* ♀.
 1l. Golden yellow, with normal anal segment. *Poseidon* ♂, *Aruana* ♂, *Cræsus* ♂, *Lydius* ♂, *Urvilliana* ♂.
 1m. Golden grey: anal tuft brown ochre, *Poseidon* ♀: with greenish-grey at the sides, and subdorsal orange and black, *Aruana* ♀. Redder towards the anus, *Eumæus* ♀.
 1n. Golden yellow with light brown orange marks. *Eumæus* ♂.
 1o. Reddish golden, with lemon yellow dorsal stripe or band of triangles, and brownish lateral marks. *Cræsus* ♂. Golden yellow and lateral marks only. *Cræsus* ♂.
 1p. Reddish grey, greenish towards the base, with faint orange brown triangulate dorsal marks. *Cræsus* ♀.
 1q. Ochraceous creamy-yellow, dotted with brown: the 3 segments from the base warm brown, dotted with light grey atoms: the remaining segments with dorsal and 2 lateral brown stripes: subdorsum yellow, strongly divided by black; lateral black dots: anal tuft reddish brown. *Lydius* ♀.
 1r. Greenish golden-grey: subdorsum yellower: anal tuft red ochre. *Urvilliana* ♀; darker greenish and reddish-grey, with dorsal brownish longitudinal stripe, *Urvilliana* var. ♀.
 1s. Stony grey and golden yellow with lateral black spots or marks, or stony reddish grey, with yellower anal segment. *Æth. Victoria*, *Reginæ*, and *Regia* ♂.
 1t. Stony-grey, yellower at the sides: lateral black dots: subdorsum golden yellow, and prominent black with each articulation; black at the base. *Victoria*, *Reginæ* ♀.

F.—THE THORAX.

1. Thorax and pronotum black, with white dots above; pectoral creamy-white dots. *D. Antimachus* ♂ ♀.
 1a. Black with white dots, and bluish-green hairs: pectoral white dots. *Zalmoxis* ♂ ♀.
 1b. Black, with broad greenish-yellow triangulate longitudinal dorsal marks, and with pectoral red mark. *Sch. Paradisea* ♂.
 1c. Entirely black dorsum, with pectoral red patch. *Paradisea* ♀, *Tithonus* ♂ ♀, *Lydius* ♀.
 1d. Black, with green, or bluish, or opal-like longitudinal dorsal mark, and large pectoral red patch.
 The genus *ÆTHEOPTERA*.

1d. Black with green or bluish, or opal-like longitudinal dorsal mark, and large pectoral red patch. *Goliath* ♀, and all the species of the Genus ORNITHOPTERA ♂ ♀ except those named below. (The pectoral red patches vary in extent from the whole length of the thorax to only a small portion, according to the species.)

1e. With double red pronotal collar. *Richmondia* ♀, *Poseidon* ♀, *Urvilliana* v. ♂.

1f. Black, with no pectoral red patch. The Genus ÆTHEOPTERA ♂ ♀.

G.—HEAD.

i. Eyes prominent, brown: villose tuft with white dots, palpi slightly porrected. *D. Antimachus* ♂ ♀, *Zalmoxis* ♂ ♀.

1a. Eyes large, nitid black, strongly underlined with white. *Sch. Paradisea* ♂, *Goliath* ♀.

1b. Eyes only faintly underlined with white; palpi not porrect, and concealed by brief villose tuft. *Paradisea* ♀, *Tithonus* ♂ ♀.

1c. Eyes light or dark castaneous brown; only faintly underlined with white: palpi concealed: villose tuft short. All the species of the Genus ORNITHOPTERA ♂ ♀ except *Lydius* ♀, where the eyes are not underlined.

1d. Eyes very faintly underlined. Genus ÆTHEOPTERA.

H.—ANTENNÆ.

i. Antennæ 2-3rds the length of the abdomen; strongly clubbed. *Antimachus* ♂ ♀.

1a. Antennæ very thin, as long as the abdomen, but gradually thickened at the club. *Zalmoxis* ♂ ♀.

1b. As long as the abdomen: straight to the club, somewhat like a Nymphalidous antenna. *Paradisea* ♂ ♀, *Tithonus* ♂ ♀.

1c. Curved a little: club not robust. *Goliath* ♀.

1d. Curved, with stout club; about the length of the abdomen. Genus ORNITHOPTERA ♂ ♀.

1e. Length of abdomen; not curved so much as in ORNITHOPTERA; club fairly straight and thick. Genus ÆTHEOPTERA ♂ ♀.

I.—THE LEGS.

i. Femora and trochanters creamy yellow, ♂; blackish yellow, ♀. *D. Antimachus*.

1a. Femora and trochanters black and slightly cream colour. *D. Zalmoxis* ♂ and ♀.

1b. Femora light yellow, trochanters dark. *Sch. Paradisea*, ♂ and ♀.

1c. Femora and trochanters black. *Sch. Tithonus*, ♂ and ♀; *Sch. Goliath* ♀.

1d. Femora and trochanters dark-brown. All the species of the Genus ORNITHOPTERA and its section *Priamoptera*. The femora are usually deeply embedded in the black and red hairy scales, which clothe the sides of the thorax, when in a state of rest.

1e. Femora and trochanters very black. *Æ. Victoriae*, *Reginæ*, and *Regis*, ♂ and ♀.

2. FEMORA of Prothoracic (or 1st) and Metathoracic (or 3rd) pairs of legs generally equal in length, the Mesothoracic (or 2nd) pair longer; *Antimachus* ♂ ♀, *Zalmoxis* ♂ ♀, *Paradisea* ♂ ♀, *Cræsus* ♀, *Lydius* ♂.

2a. Femora of unequal length. *Tithonus* ♂ ♀, *Priamus* ♀, *Urvilliana* ♂ ♀, *Poseidon* and vars. ♂ ♀, *Aruana* ♂ ♀, *Eumæus* ♂ ♀, *Cræsus* ♂, *Lydius* ♀.

2b. Femora of 1st and 2nd pairs longer than the 3rd. *Priamus* ♂, *Cassandra* ♀, *Richmondia* ♂, *Reginæ* ♂ ♀.

2c. Femora of 2nd and 3rd pairs equal lengths; 1st pair shorter. *Cassandra* ♂, *Pegasus* ♂ ♀, *Victoriae* ♂.

2d. All 3 pairs equal in length. *Richmondia* ♀, *Victoriae* ♀.

3. TIBIA. All 3 pairs unequal in length. *Antimachus* ♂ ♀, *Zalmoxis* ♂, *Paradisea* ♂, *Tithonus* ♂ ♀, *Priamus* ♀, *Cassandra* ♂ ♀, *Aruana* ♂, *Eumæus* ♀, *Cræsus* ♂ ♀, *Lydius* ♂ ♀, *Urvilliana* ♂ ♀, *Victoriae* ♀.

3a. The 2nd and 3rd pairs longer than the 1st. *Paradisea* ♀, *Richmondia* ♀, *Pegasus* ♂, *Aruana* ♀, *Eumæus* ♂.

3b. The 1st and 3rd pairs equal in length; the 3rd pair longer. *Priamus* ♂, *Richmondia* ♂, *Reginæ* ♀.

3c. The 1st and 3rd pairs equal in length; the 2nd pair longer. *Pegasus* ♀, *Brunneus* ♀, *Poseidon* and vars. ♂ ♀, *Victoriae* ♂.

4. Tarsi. The 2nd and 3rd pairs equal in length; 1st pair shorter. *Priamus* ♀, *Cassandra* ♂, *Richmondia* ♂ ♀, *Pegasus* ♂ ♀, *Poseidon* and vars. ♀, *Eumæus* ♂, *Lydius* ♀, *Victoriae* ♀, *Reginæ* ♀.

4a. First pair longest; the 2nd and 3rd pairs equal in length. *Zalmoxis* ♂.

4b. First and 2nd pairs equal in length; the 3rd shorter. *Urvilliana* ♀.

4c. The 3 pairs unequal in length, but the 2nd pair the longest. *Paradisea* ♂ ♀, *Tithonus* ♂ ♀.

4d. Unequal in length, but the 3rd pair the longest. *Priamus* ♂, *Cassandra* ♀, *Aruana* ♂ ♀, *Cræsus* ♂ ♀, *Victoriae* ♂, *Lydius* ♂.

4e. Unequal in length, but the 1st pair the longest. *Urvilliana* ♂.

4f. Equal in length. *Poseidon* ♂. *Brunneus* ♀, *Eumæus* ♀.

5. Anterior leg: with the 1st tarsus nearly equalling the total length of the 2nd, 3rd, and 4th tarsi; the latter 3 of equal lengths; the 5th tarsus (without the unguis or tarsal claws) nearly the united length of the 2nd and 3rd. *D. Antimachus* ♂.
- 5a. First tarsus nearly the total length of the other 4 tarsi; tibia about 2-5ths the total length of the first 4 tarsi; femur nearly 1-3rd the total length of the tibia and tarsi. *D. Antimachus* ♀.
- 5b. Ant. leg: with 1st tarsus the total length of the other 4 tarsi (including the unguis). *D. Zalmoxis* ♂.
- 5bb. Ant. leg: with the 1st tarsus the united length of the other 4 tarsi (not including the unguis). *Sch. Paradisea* ♂.
- 5bbb. Tibia equals the total length of first 3 tarsi; the first tarsus as long as the united 2nd, 3rd, and 4th tarsi; length of the last tarsi unequal, the 5th being the longest; the femur half the united lengths of the tibia and tarsi. *Sch. Paradisea*.
- 5c. Ant. legs: 1st tarsus equals 3-4ths of the total length of the other 4 tarsi (including the unguis); the 4 short tarsi of different lengths—the 2nd and 5th being the longest, and the 4th the shortest; the tibia is half the length of the 5 tarsi. *Genus ORNITHOPTERA* ♂ ♂.
- 5cc. Ant. leg: with the tibia nearly equaling the total length of the 5 tarsi; the 2nd to the 5th tarsi unequal in length—the 2nd and 5th longest, the 4th shortest. *ORNITHOPTERA* ♀ ♀.
- 5d. Ant. leg: with the 1st tarsus equal to total length of the other 4 tarsi; the 2nd, 3rd, 4th, and 5th of different lengths—the 2nd and 5th longest, the 4th shortest. *Section PRIAMOPTERA* ♂ ♂.
- 5dd. Ant. leg: tibia equals the total length of the 1st 4 tarsi; the 1st tarsus equals the total length of the other 4 tarsi; the 4 short tarsi are of different lengths—the 2nd and 5th longest, the 4th shortest; the femur is half the total length of the whole leg. *Section PRIAMOPTERA* ♀ ♀.
- 5c. Ant. legs: femur equals half the total length of the tibia and tarsi; the 1st tarsus equals the total length of the other 4 tarsi (without the unguis). *ÆTHEOPTERA* ♂ ♂.
- 5d. Tibia equal to total length of first 4 tarsi; 1st tarsus equals total length of the other 4 (with the unguis). *ÆTHEOPTERA* ♀ ♀.
6. Mesothoracic or middle leg: 1st tarsus equals in length the 2nd, 3rd, and 4th tarsi; the 2nd, 3rd, and 4th of equal length; the 5th (with the unguis) nearly 3-4ths the length of the 1st. *D. Antimachus* ♂.
- 6a. 1st tarsus in length as in the ♂; the 2nd, 3rd, and 4th of equal length; the 5th about half the length of the 1st (with the tarsal claws). *D. Antimachus* ♀.
- 6b. Mesothoracic leg: tibia equals total lengths of the first 4 tarsi; 1st tarsus equal to 2nd and 3rd; the 4th and 5th equal the 2nd and 3rd; femur 1-3rd the total length of tibia and tarsi. *Sch. Paradisea* ♂.
- 6bb. Tibia equals length of 1st and 2nd tarsi; 1st tarsus equals total length of the 2nd, 3rd, and 4th tarsi; femur 1-3rd the total length of the tibia and tarsi. *Sch. Paradisea* ♀.
- 6c. Mesothoracic leg: the tibia equals the first 4 tarsi in length; length of tarsi unequal—the 2nd and 5th are the longest, and of equal length. *ORNITHOPTERA* ♂ ♂.
- 6cc. Tibia nearly equals the total length of the 5 tarsi; the first tarsus equals the total length of the 2nd, 3rd, and 4th tarsi; the last 4 unequal in length—the 2nd and 5th being the longest, and the 4th the shortest. *ORNITHOPTERA* ♀ ♀.
- 6d. Mesothoracic leg: tibia equals the first 4 tarsi in length; the 1st tarsus as long as the total of the 2nd, 3rd and 4th tarsi; the 4 short tarsi of different lengths; the femur half the total length of the tibia and tarsi. *Section PRIAMOPTERA* ♂ ♂.
- 6dd. The 1st tarsus half the total length of the other 4; the 2nd and 3rd tarsi longest; the 4th shortest. *PRIAMOPTERA* ♀ ♀.
- 6e. Mesothoracic leg: length of tibia equals the total length of the 5 tarsi; 1st tarsus equals the total length of the other 4. *ÆTHEOPTERA* ♂ ♂.
- 6f. Tibia equals length of the 1st, 2nd and 3rd tarsi; 1st tarsus equals total lengths of the other 4. *ÆTHEOPTERA* ♀ ♀.
7. POSTERIOR LEG. First tarsus slightly exceeds twice the length of the 2nd; the 3rd and 4th equal to each other, but each a trifle longer than the 2nd; the 5th (without the unguis) about equal to the 2nd. *D. Antimachus* ♂.
- 7a. Posterior leg: tibia equals the length of first 3 tarsi; the 2nd, 3rd and 4th tarsi of equal lengths; the femur equals half the total lengths of the tibia and to the penultimate (or 4th) tarsus. *D. Antimachus* ♀.
- 7b. Posterior leg: tibia equals total length of the 5 tarsi; 1st tarsus equals total lengths of 2nd, 3rd and 4th tarsi; the last 4 tarsi of nearly equal lengths. *D. Zalmoxis* ♂.
- 7c. Posterior leg: 1st tarsus equals total length of 2nd, 3rd and 4th tarsi; tibia equals 1st, 2nd and 3rd tarsi; the last 4 tarsi nearly of equal lengths; femur about 1-3rd the united lengths of the tibia and tarsi. *Sch. Paradisea* ♂.
- 7cc. The first tarsus equals the total lengths of the 2nd, 3rd and 4th tarsi; tibia equals the 1st and 2nd tarsi; the 2nd and 3rd nearly equal in length; femur about 1-3rd the united lengths of the tibia and tarsi. *Sch. Paredisea* ♀.

- 7d. Posterior leg : tibia equals the total lengths of tarsi 1 to 4 ; tarsi 2 to 5 unequal in length—the 2nd and 5th longest, the 4th shortest. ORNITHOPTERA ♂.
- 7dd. Tibia equals the length of the first 4 tarsi ; the 1st tarsus as long as the other 4 ; the 2nd and 5th the longest, the 4th shortest. ORNITHOPTERA ♀.
- 7e. Posterior leg : the tibia equals total length of the first 4 tarsi ; the 1st tarsus nearly half the total length of the 2nd to the 5th. Section PRIAMOPTERA ♂.
- 7ee. Tibia equals the total length of the first 3 tarsi ; and the 1st tarsus equals the total length of the other 4. PRIAMOPTERA ♀.
- 7f. Posterior leg : tibia equals total lengths of first 3 tarsi ; the 1st tarsus as long as the other 4 ; the last 4 tarsi nearly of equal length. ÆTHEOPTERA ♂.
- 7ff. Tibia equals total lengths of first 3 tarsi ; the first tarsus equals in length the other 4 ; the 2nd, 3rd, and 5th tarsi are nearly of uniform length, the 4th shortest. ÆTHEOPTERA ♀.*
8. A pair of sharp curved spines at the termination of the tibia of the 2nd and 3rd pair of legs, throughout the group.
9. The base of the tarsal claws (or unguis) is bulbous, the bifid claws rather long, and graduated to a sharp point ; fixed to a raised platform at the extremity of the 5th tarsus. [Pl. III. of this vol. fig. 5e.] D. ANTIMACHUS ♂.
- 9a. The bulbous base of the tarsal claws more depressed, not resting on a raised portion of the 5th tarsus, but inserted in a slight concave depression at the termination of the tarsus ; the bifid claws are not so graduated to their points, but are slightly swollen midway of their length. [See Pl. I., figs. xxxxa and xxxxb.] Genus ORNITHOPTERA.

*The above measurements may seem unnecessary at present, especially as they only apply to part of a limited group of insects—very little in this way having been done with Lepidoptera ; but all the same I present them, feeling sure that even the most apparently unimportant details of insect measurement may some day prove to be useful, when the subject comes to be more fully studied. As in the human form there is a beautiful series of mathematical and geometrical proportions observed between the dimensions of its different parts and members, so in insect forms we shall be able to discover many beautiful illustrations of these anatomical laws of proportion, which may ultimately prove instructive, even in deciding upon the limits of genera and species. In the study of the Coleoptera this has long been recognised. I may here observe that the above measurements, in each case, are fairly representative of all the species of each genus, as far as I can judge ; but that there are occasionally slight exceptions to be met with. The general Synopsis of the Genera TROGONOPTERA and POMPHOPTERA will be given in the second vol. of this work.

THE GEOGRAPHICAL DISTRIBUTION OF THE TRIBE TROIDES OF HUBNER, OR
ORNITHOPTERA OF BOISDUVAL.

PART I.

When, in 1890, this Monograph was commenced, with two exceptions the whole of the species of this tribe then known and accepted were included by Authors in the genus to which Boisduval had long before given the name *Ornithoptera*. But for a considerable time the students of these wonderful insects had become accustomed to recognise three distinct types of form, under two of which a fairly large number of species or sub-species naturally grouped themselves. Hence the custom, which, for convenience sake, was established, of calling them the *Priamus*, the *Brookeanus*, and the *Pompeus* groups. But these group names after all were only the adopted designations, each of a set of forms wearing a certain livery, or adorned with a style of colouration and pattern, common to all, or nearly all, the members of that coterie, whatever their specific distinctions might happen to be. The larger idea of some special structure or character existing, of sufficient importance to justify such a separation into groups, which might ultimately be recognised as subgenera or genera, does not appear to have been taken much into account. It had, for so long a time, been considered that even the separation of the Ornithoptera from the huge Genus *Papilio*, was because in personal appearance they so unmistakeably differed from the other members of that genus, rather than in any important structural or anatomical characters. A similar plan has long been accepted in the systematic arrangement of the *Papilios*, which it was found necessary to divide into a larger or smaller number of groups, according to the views of different Authors, with group names,—though the more advanced students have since become convinced that *Papilio* must be admitted to be composed of a considerable set of genera or subgenera, which may be created just as reasonably as many of the genera that are made in other families of Diurnal or Heterocerous Lepidoptera.

For a time this triad of Ornithopterous groups was found very convenient. We all knew that the *PRIAMUS* group contained only black, green and yellow; violet, black, green and yellow; or orange, black and green insects, all the males of which bore a close resemblance or family likeness to *O. Priamus* in pattern and outline, and generally in colour;—that the *BROOKEANUS* Group meant any species with the facies of *O. Brookeana*;—and that the black and yellow forms, though often differing in size and pattern from *O. Pompeus*, were nevertheless unmistakably members of the *POMPEUS* Group. In the case of the *Priamus* Group it was the opinion of the best entomologists that nearly all the described species were little more than local varieties of the species *Priamus*, just as a good many of the black and yellow forms could only be regarded as local forms or varieties of *O. Pompeus*. There remained, however, one insect, a female, quite unique, *O. Victoriae*, and a second unique, a male, *O. Tithonus*, which did not fit into either of these groups, and whether the *Victoriae* ♀ was the mate of the ♂ *Tithonus*, or of another species, it was for many years impossible to say; at any rate neither of these curious insects would fit into either of the groups named above. It is shown in the body of this work that they each represented a distinct genus—one preceeding and the other succeeding the Genus *Ornithoptera*,—and were representatives of a different geographical realm.

Latterly, and *some little* time before the commencement of this Monograph, one or two species of African *Papilios* were suspected to belong to the Ornithoptera, although, in personal appearance, they seemed, *prima facie*, only to come into some position well removed from this tribe; these were Hewitson's *P. Zalmoxis* and White's *P. Ridleyanus*. Later on a suggestion arose that Drury's *P. Antimachus* might also be an Ornithoptera, as will be seen in the body of this work. But while I am obliged to include *Zalmoxis* and *Antimachus*, I am compelled to reject *Ridleyanus*.

But since the commencement of this work, a very important series of insects belonging to the Ornithoptera have been discovered—many of them in entirely new localities, some of which indeed had never before been explored for the collection of zoological specimens, so far as we are aware; the results being that it has been necessary to establish two new genera for the reception of some of them; that we have obtained a larger idea of the variety and wonderful magnificence of these and other insects; and that the geographical area which the different forms inhabit has been enormously extended—a striking contrast to the knowledge of these insects possessed by our predecessors at the end of the last, and beginning of the present, century! At that time the Island of Ceram in the Moluccas was known to contain 2 or 3 species, *O. Priamus* (type form) and *P. Hippolytus*, &c. for example; Java was known as the metropolis of *P. Pompeus* and one or two more species of that genus, and a fictitious species *Pap. Pseudopandarus** had been described by Esper as coming from India. With perhaps one or two exceptions this then was the extent of the specific and geographical knowledge of this tribe of butterflies possessed by the great entomologists of that day.

Now, there is a whole series of species of *Papilionide* inhabiting South and Central America, and some of the West Indian Islands, which are generally arranged just after the Ornithoptera, though hitherto they have been regarded as true *Papilios*; but a careful and comparative examination of these alongside of the Ornithoptera will enable us to understand that they should be included among the latter, either as a sub-tribe, or at any rate a big genus of that tribe—though I shall have to show at the end of the 2nd Vol. of this work that they belong to at least 2 genera.

*Esper, "Ausz. Schmett." t. 40, f. 1 (1785—1798); quoted also as *Pap. Pandarus*, Jabl. "Natur. Schmett." I., t. 6, f. 1 (1783); "Godt. Enc. M'th." IX., p. 27, n. 5 (1819); Conf. Boisduv. Sp. Gén. I., p. 181 (1836), India?

These are the insects for which I have proposed the general name of *Ornithopterina*—a group I shall endeavour to properly characterise in that place.

Admitting therefore these foregoing considerations, we have at the present time a vast geographical area of the globe—including portions of four continents, where Ornithoptera may be found.

A broad geographical outline then gives us the following general results, leaving the details to be considered later on :—

1. The genus *DRURYA* ranges over a large portion of West Africa, from Old Calabar to some locality far up the Congo River, and other districts.
2. The genus *SCHOENBERGIA* has its home in German New Guinea, and the Island of Waigeu.
3. The genus *ORNITHOPTERA* inhabits many parts of Australia, the Molucca, Papuan, and Solomon Archipelagos, and at least portions of New Guinea, both British and German.
4. The genus *ÆTHEOPTERA* has its metropolis in the Solomon Islands.
5. The genus *TROGONOPTERA* inhabits Borneo and Sumatra, and one of the Philippine Islands.
6. The genus *POMPEUS* ranges over India and up nearly into Thibet, Ceylon, Java, a large proportion of the East Indian and Papuan Archipelagos, the Philippines, and New Guinea.
7. The Ornithopterina may be found in S. America, from Brazil to Panama; and in Central America almost into Mexico, besides some of the West Indian Islands—Jamaica and Haiti, for example.

Thus it will appear that with the exception of Africa and the New World, this tribe is confined to Oriental Countries. None of its members inhabit Europe, the four or five species of *Papilionidæ* that inhabit this Continent are very far removed from the Ornithoptera, and two of these are Asiatic; but none are known in China or Japan, so far as I am aware, while in Asia they are probably not to be found so far N. West of India as Afghanistan.

Having given this general view, it now becomes a duty to enter with more detail into the geographical distribution of the first four genera, which are contained in this vol., leaving the remaining part of the subject to its appropriate place in the 2nd vol., when it will be supplemented by special tables, which will enable us to understand at a glance the range of each species or variety of the tribe.

1. THE GENUS *DRURYA*.

The geographical area over which this genus is found, is, broadly speaking, immense; as may be seen by reference to Map 1; and as regards the type species *D. Antimachus* it is very unlikely that we yet know the full extent of its territory; for as the interior of West and S.-West Africa become more fully and zoologically explored, probably a vast number of unsuspected localities may be established for it. Judging from some indications afforded in the chronological history of its discovery, this species would appear to be rather a wandering or aggressive one—gradually extending its territory as fast as the discovery of the necessary conditions renders this possible. And this is all the more possible and probable inasmuch as it has for some good and imaginable reason in the past of its history been caused to assume an *Acræoid* livery; for, though the *Acræa* which originally it superficially copied has probably long been extinct, and the Ornithoptera is no longer able to benefit by its association with an insect of higher family rank, yet its swift flight, and very prominent appearance of being an inedible species may be very potent factors in enabling it to live and gradually extend its area with little or no persecution. This would be rendered even more easy, as both sexes of the species wear the same protective adornments and wing-forms.

The first example which came to England in 1775 was brought from Sierra Leone, or from a North Latitude of 8° 29' or so, and a West Longitude of 13° 15'. It may be that the insect (a ♂) was not taken in any of the swamps or mountainous localities near the settlement, but at some locality a good way inland; and this would account for such a fine and attractive insect not again appearing for so many years.

The next place where it was found was Creek Town, Old Calabar, in the Bight of Biafra, about 52 miles N. by W. of Fernando Po in 5° N. lat., and 7° 30' E. long.; after this again, in the Gaboon, nearly five degrees further South, in about 9° 30' of E. longitude; then at Amba Bay, North of the Cameroons; and then again at the North of Sherboro' River, no great distance from where it had first been discovered. In a little over 1° 45' or 50' S. of the Gaboon begins the Ogowai (or Egowé) River, in the French Congo district, and about 3° E. of its mouth the species has been found more plentifully. It was taken also by Mr. William Bonny on the journey with Stanley from Yambuya on the Aruwimi River, through the Great Forest of Central Africa; a district in which the Butterflies appear to consist for the most part of species common to the West Coast—very few peculiar to the East Coast being met with. The Aruwimi River is one of the more important tributaries of the Congo. It empties itself into that great river at Basoko, in about 22° 40' E. long., and 1° 18' N. lat. Yambuya, where the species was taken, is situated in 25° 6' E. long., and 1° 12' N.

lat. approximately. The Aruwimi runs a little more than 7° East to the Blue Mountains which feed Lake Albert Nyanza, about midway of its length curving to 2° of N. lat., or $3\frac{1}{4}$ ths of a degree farther north; and reaching its source a little more north of these Mountains, or $1^{\circ} 35'$ S.W. of Stanley Falls. Probably *Antimachus* may be found over the whole of this immense distance. Examples are in the Tring Museum from Bopoto (or should it not be Upoto?) on the Congo, in $21^{\circ} 30'$ E. long., and $2^{\circ} 8'$ N. lat.— $3\frac{1}{2}$ degrees N.W. of Yambuyo; and it has been received by Dr. Staüding, from Stanley Falls.

These facts therefore give the species roundly and approximately a range of $9\frac{1}{2}^{\circ}$ of N. latitude, by 1° of S. latitude; and 13° W. longitude by 11° E. longitude. How far inland at or from any of these points N., W., or East it pushes its territory it is not possible at present to decide, but it must be for long distances. Possibly the species is common over the whole of these districts, and beyond.

The other species of this genus at present known, *D. Zalmoxis*, is found plentifully at Old Calabar in the Cameroons, in the Gaboon, at Kabinda (or Kabenda) a very little North of the mouth of the Congo, and also among other places at Isubu, in the Cameroon district. In Angola, South of the Congo (lat. $8^{\circ} 20'$ to $9^{\circ} 30'$ S., and long. 14° to 19° E.) this species was taken some years ago by the late Mr. and Mrs. Monteiro; some of the examples being very deep in colour. It also appears to range along the N. and S. banks of the Congo to a considerable distance; to be fairly common at Stanley Falls; and it has likewise been found on the mountainous Island of Fernando Po, half a degree West of Cameroons River—an Island whose highest point is 9,350 feet. Probably these mountains were a part of the Cameroons range before the island was separated from the mainland—the highest point of the latter being still greater, or of an altitude of 12,992 feet.

It is not unlikely that both species of the genus also inhabit tracts of country on the banks of the Niger.

Old Calabar River which empties itself into the Bight or Bay of Biafra is the largest river on the coast of Upper Guinea. It forms an estuary, with a width of 9 miles, abounding in shallows and sandbanks on small low islands. From this point the river is very winding, and the shores on either side for a good distance from the river banks consist chiefly of swampy and intensely unhealthy ground—which is rarely above the level of the river, where mangroves and other swampy vegetation flourishes. The right, or north bank is intersected by many creeks, by which communication exists with several of the rivers and streams that flow into the Gulf of Guinea between the Old and New Calabar districts and Benin, forming the great delta of the Quorra or Niger,* or extending N.W. and Northward more than $3\frac{1}{2}$ degrees from old Calabar. To the eastward of Calabar is the high land of the Cameroons, starting with a peak nearly 13,000 feet high, in lat. $4^{\circ} 13'$ N., and long. $9^{\circ} 10'$ E., and uniting with the mountain range that marks the coast northwards. All the parts of the coast of New Calabar for 40 or 50 miles inland, are as swampy and primitive in character as that of Old Calabar. As I have shown in another place a peculiar feature of the Lepidopterous fauna of this coast and for a long way inland, is the prevalence of blue green, olive green, steel-blue with brick red or violet crimson, insects of several families, and the very considerable number of species, especially of *Romalæosoma* and *Papilio* that have been discovered in these swampy wildernesses, and in all this part of West Africa, including Ashanti. The coast all the way from Old Calabar River to Betika ba Massongo is so broken up as to give it somewhat of the appearance on a small scale of the fjords of Norway or Scotland, or those on the West side of S. America from the Chonos Archipelago to near Cape Horn. Again, from Ambas Bay to Melimba Town at the mouth of the Sannaga River, a similar character of coast, though not quite so broken up, is met with. Duke Town (Atakpa) is situated on the east bank of this fjord—like Old Calabar River, a little over one degree north of its mouth; and Creek Town (Okuritungko)—practically the metropolis of the district—a few miles farther in north. A number of other rivers and their branches extend into the country along this coast Northward and North-eastward from Old Calabar to the Cameroons.

Sierra Leone, from whence the first example of this species was brought must be understood as an extensive British province, and not merely the peninsula, with Free Town as its capital, that was a few years ago thought of when the district was mentioned. Indeed, if the latter area were only taken into account, it would be almost impossible to understand how so grand an insect as *D. Antimachus*, to say nothing of other fine things, could for so long a time have escaped the notice of Nature's Observers. But the whole province measures about 170 miles from Free Town in a straight line eastward to Kono; and about 215 miles in a bee line from the mouth of the Sulymah River northward to Falaba. Two branches of the Joliba or Niger seem to reach their source at Temba and Kumba, about 50 or 55 miles S. West of these places, while the Rockelle River which empties itself into the sea near Free Town, under the name of the Sierra Leone River, also commences a little north of Temba in British territory.

Free Town is built on the north shore of the Sierra Leone (or Leona) peninsula, and the 25 miles of this district consist chiefly of a range of conical mountains, from 2,000 to 3,000 feet in height, surrounded by a belt of level ground from 1 to 5 miles broad. Originally the Sierra Leone coast was considered by geographers to extend from Cape Verga 145 miles farther north, now a part of French territory. But it practically extends from Yellaboi Island, north of Free Town, to a trifle beyond Sulymah, taking Sherboro Island (another locality of *Antimachus*) half-way in its course. At Cape Verga, itself high ground, a moderately-elevated tract of hill country begins, extending N. by East and then eastward till it reaches the mountain ranges which surround the table land of Foota Jallon, near 11° W. longitude. Along this course the land never rises much more than 1,000 feet, and is much broken by ravines and narrow valleys, especially to the west. A second and continuous range commences east of this point, trending West and East till it

*One of the native names of the Joliba.

meets a third range, running north and south (between 10° and 9° N. lat., and 10° and 9° W. long.), extending to the sources of the Joliba.

From Cape Verga to Alligator Point the coast is generally flat and low, formed into numerous islands by the many branches into which the river Pongas divides before reaching the sea. The coast rises soon after at Tumbo Point, south of Alligator Point, until it attains an elevation of 2,910 feet at Mount Kakulimah, and Mount Soomba 1,705 feet. From thence for a hundred miles due south to Sierra Leone it is once more very low and flat, and consists of numerous islands. Between Sierra Leone and Yawry Bay it is again high and rocky; but the eastern shores of the latter bay, and those extending to Sherboro Island are once more low, flat, and subject to change. The greater part of this long coast is chiefly a mangrove swamp—so unhealthy at one time that *Tulloch*, in his "Report on the Health of our Troops," informs us that from the impenetrable fog, the immense rainfall from May or June to October or November, fevers of every type, dysentery, liver complaints, and other diseases raged (a few years ago) to such an extent that from half to three-fourths of our troops perished annually. This was from 1819 to 1836. Since then, however, matters have greatly improved, as happily is the case all along the West Coast of Africa, though this is still not saying much. With the exception of Kakulimah and the Soomba Mountains the western portion of Sierra Leone is a low plain extending more than 100 miles inland. This plain is very level, except in a few places, and during the rainy season is converted in many parts into swamps; when the waters have retired these tracts are covered mostly by tall, grassy jungle 8 or 10 feet high. In other parts are extensive meadows and intermittent forest growths. Insect life is pretty abundant in these districts; and on the sides of the mountain ranges, and in the more arboreal localities, both *Antimachus* and *Zalmoxis* should abound.

An almost continuous range of mountains runs South and North across the country between 11° and 12° W. long, but they are pierced by the rivers that originate further east, and in an east and west direction have hewn out large and wide valleys. These valleys are exceedingly fertile; the base of many of the hills are clothed with trees, mostly of a few kinds; and the higher slopes of the hills to their summits with evergreen groves and palm trees. The valleys being watered by numerous rivulets which are continually bringing down fresh soil from the hills, are exceedingly fertile, and the whole region is capable of supplying most of the needs of man and of his domesticated animals. The remainder or more eastern part of the country for about 80 or 90 miles east and west, is more level, with undulating surface, in parts broken by deep ravines and numerous rivulets which form a series of what may be called cañons, as they are sunken considerably below the general level. All the valleys and lower depressions (the elevation never exceeds 300 feet above sea level) are remarkable for fertility—caused by the vegetable soil being very rich with an admixture of iron-clay and sand. The heat of the country is great all the year round, being generally over 80° Fahr., but greatest just before the setting in of the rainy season—though the heat of the hilly country is at least 5° less. Wild animals and insects abound, as might be expected.

The province of Angola, where *Zalmoxis* has been taken, is a large tract of country extending longitudinally southward from the Congo country almost to Mossamedes on the 16th parallel of S. latitude; and from about 14° to 19° of E. longitude; in one part nearly to the bank of the Zambesi. Within its area (which is not as exactly certain as could be desired, though it must be at least 18,000 to 20,000 square miles) are included Loanda, of which the coast town St. Paulo de Loanda is the capital, Benguella or Benguela, Lovale and the Lobale river districts, Amboella, and part of Mossamedes. It will be seen, by reference to a map, that all the western part of the country for about 5 degrees of longitude is exceedingly mountainous; and that the whole of the country is well drained by a multitude of important rivers, and their branches especially as we advance eastwards, where the country becomes lower or flatter. The land appears to be encroaching on the sea, especially along the coast of Loanda. The Isle of Loanda and Cape Palmareinho are supposed to have been formed in this way. The land thus gained is entirely of an alluvial and level character. The vegetation of the country is on a scale of magnificence quite equal to the grandest of tropical countries; the animal life is as varied and abundant as in any part of Africa;—most of the larger creatures, many species of monkeys, an immense number of species of birds,—including many parrots,—lizards, two or three species of crocodiles, and an endless list of insects of all orders are among the denizens of the land. The waters, both inland, and on the coast littoral, are also rich in fish and crustacea. The rivers often swarm with fish, many of which, like the birds and insects are of glorious beauty. It will be understood that the variety of vegetation must therefore be equally great and interesting. As the physical geography of this country in many respects greatly resembles that of the Congo States, it is quite likely that the two species of the genus *Druxia* range over the whole country. *Antimachus*, by its rapid and high flight being less likely to be often seen than is *Zalmoxis*.

2. THE GENUS *SCHOENBERGIA*.

The three species of this Genus are geographically removed some considerable distance from each other, if we are to judge from the material that has thus far come to hand. German New Guinea, the home of *Sch. Paradisea* is more than 1,200 miles south-east of the island of Waigen, the home of *Sch. Tithonus*; an island which Wallace visited, and in which he spent several months collecting—an island which, though he did not obtain such fine collections as in other districts he explored, nevertheless supplied him with the beautiful Red Bird of Paradise (*Paradisea rubra*) and "the lovely little dove among the birds (*Ptilonopus pulchellus*);" the rare New Guinea Kite (*Henicopernis longicauda*); a large

new goatsucker (*Podargus superciliaris*); and a ground pigeon with a long and powerful bill (*Henicophaps albifrons*); besides one Ornithoptera and several singularly beautiful Ericinidæ (Sospita and Taxila), a number of Lycænidae of a gorgeous character, and the beautiful Pieris (*Thyca aruna*) of Hewitson.

It may be said that comparatively little is yet known of the physiographical and zoographical character of the great island of New Guinea. Up to the present time, though some important work has been done by explorers and naturalists in the island, very little more than the fringe or coast districts have really been properly examined; and this applies more especially to the S. Eastern peninsula-like tract of land, extending say from East Cape and Samarai to Holnicote Bay on the Eastern or N. Eastern side, and to the mouth of the Fly River and a comparatively short distance on the Western or S. Western side on British territory. After that, with the exception of a very small portion of German New Guinea round about the Finisterre Mountains, and a slightly larger part of the North-western or Dutch portion of the island, the map of the country presents about as blank an appearance as a map of the interior of Africa did less than one hundred years ago; for *Terra Incognita* may well be written therein. If so, what a prospect is thereby opened up to us yet of wonderful discoveries in animal and vegetable life! a prospect which appears by no means too hopeful, if we are to judge by the truly marvellous and glorious discoveries that are continually being made, with each extension of an intelligent and enthusiastic investigation of its products.

The Finisterre Mountains, among which Sattleberg Mountain is situated, are an important group, the highest of which is 11,391 feet high. Their position is about 145° 9' to 147° 10' East long., and 5° 6' to 6° 3' South lat. On the Western and Southern sides of these mountains, a small river extends from the coast near Constantine Harbour, in the German Astrolabe Bay,* with a sinuous course, up a rather narrow valley to the foot of this mountain range—a distance probably, allowing for its windings, of about 70 or 75 miles. The name of this river is the Kabenau. The Finisterre Mountains are united at their north-western point—following the windings of the Kabenau, with a narrow range running parallel to the Macley coast till they meet the Cromwell Hills (1,710 feet high); these in their turn are succeeded by the Rawlinson Range, which look out over the Huon Gulf, whose waters wash the southern shore of Kaiser Wilhelm's land. A small stream which divides the Rawlinson Range from Kraetke Mountains (9,843 to 11,403 feet high) runs down and empties itself into the Gulf near Port Parsee. This is the Markham River. Four other mountain ranges follow, trending westward and northward, the Zoller, Otto, Bismark, and Kuper Ranges (the last 1,969 feet high); all these are crowded together, with several narrow valleys, into an amphitheatre-like space of about 165 by 110 miles roughly considered—a very respectable group of mountains nevertheless; and already proved to contain some wonderful lepidoptera and other glorious things. This space is probably the best surveyed of the German part of the island.

On the southern side of the Island, in the British possessions, from a point a little west of the Bismark Mountains to the extreme south and east of the island, the whole coast is mountainous, range following range down to East Cape and China Straits, arranged in the following order:—From N. West to S. and S.-East—The Albert Victor Mountains, where the Jubilee River has its source; the Albert Range; Mount Yule (10,046 feet high); Mount Victoria (13,121 feet high); Mount Nisbet; Mount Obree (10,246 feet); Mount Brown (7,947 feet high); Mount Clarence (6,330 feet high); Mount Suckling, east of the latter (11,226 feet high); Mount Thompson (5,901 feet high); and Mount Samarai (4,478 feet high). These may be regarded as really one extensive range, unbroken in their course, but having special names given to their higher peaks; and altogether they constitute the backbone of the great Peninsula, running down nearly midway, though rather more westward than eastward, for the greater part of its course. The approximate length of this mountain system would be (not reckoning its sinuations) about 560 miles. The extensive portions of the island north-west, and south-west of this range, within British territory, and for 408 miles and more to west and north in Dutch territory would appear to be flat land, pierced for nearly 260 miles in one part by the Charles Louis Mountains; but this is only because the country has not yet been sufficiently explored to enable geographers to better understand its physical condition. But we shall have more to say about this part of the island in the 2nd vol. of this work. Probably the Great Victor Emmanuel Range of Mountains, which in the German territory commences about 40 miles from the east coast opposite Vulkan island, and stretches away almost in a straight line Westwards to some distance within the Dutch line, will be found, when the country is better known, to unite with the Charles Louis Mountains advancing from Kapia, West to East (all in Dutch territory, with peaks whose heights are respectively 9,515, 11,912, 13,786, and 16,733 feet), and so to form a natural boundary line, dividing two zoological provinces. The north and north-west portions of the island, Tana Beran, and Onin (themselves almost separated into distinct islands, the first by the McChiver inlet, and the second by a narrow channel running northward from this inlet to Kamraub), and the more eastern part of the country towards Kapia, are better known—though only comparatively: and it is a rich zoological district, in which Lepidoptera (and Ornithoptera) are by no means poorly represented. In the Arfak Mountains and at Amberbaken, on the north-east coast, some good work done, leads us to hope for still better things in the future. These districts are all very mountainous—the highest point yet ascertained being in the Arfak range, 9,521 feet. Beyond the western and north-western end of New Guinea the sea is rich in islands of great zoological importance, even to our particular portion of the subject—several of which Wallace visited and collected in, such as WAGIEU, Salawatti, Mysol, &c. Beyond the south-eastern end of New Guinea and almost parallel with the eastern coast for 100 miles, are numerous islands and islets, the most important being Fergusson (or Moratau) a mountainous island (5,906 feet high at its highest). The D'Entrecasteau Archipelago (from whence have been brought some of the most beautiful butterflies, especially among the Lycænidae, that have yet been discovered), and a multitude of islets and rocks crowd the sea as far S.W. as the Louisiade Archipelago.

*There are two Bays of this name—the English Astrolabe Bay being on the Southern side of the Island, near Port Moresby.

But of the three political divisions of New Guinea, the Dutch portion is, taking all things into consideration, the most important and valuable part of the island—at any rate so far as its coast lines are concerned. A glance at a good map will show that the more north-western and south-western coasts are indented and worn into greater or lesser Bays, right up on the south side, almost from the two or three degrees of the Dutch boundary line, or in longitude 138° East to about E. long. 131° ; and on the north side from E. long. $137^{\circ} 30'$ to 134° . The McCluer inlet on the western side, pierces the land nearly through to Geelvink Bay on the eastern side (for only about ten miles intervene between them). Geelvink Bay represents a huge excision of coast of the most remarkable character—the two extreme points of which are quite 230 miles apart: the land having been cut out to the extent of quite 170 miles. Within this Bay is an enormous coast line of between 400 and 500 miles, with many smaller Bays and Harbours, and a number of islands, such as Jobi, and outside the Bay the Schouten Islands. The eastern point of the Bay is also cut up by the big river Ambernoh and its branches into at least 8 islands, that are otherwise really a part of the main land. On the western side, besides the McCluer inlet there is a considerable number of Bays and Harbours—many of which must be of great value.

Some important rivers also drain the extensive south-west of the island; whilst Batanta and Waigieu appear at some time in the past to have been separated from the mainland. The Mountain Ranges, so far as they have been explored, are generally clothed with dense tropical vegetation: the Arfak and Charles Louis Mountains reach the limit of perpetual snow.*

All these parts of this island are subject to great rainfalls through a considerable part of the year; and explorers speak of the forests and vegetation as being continually saturated with moisture, which sends up clouds of steamy mist, just as one may see it doing in the rainy season on the New Granadian Coast of South America. The country, however, is probably not more debilitating than in British New Guinea, where, with the exception of the district of the Owen Stanley Mountains, the extensive flat portions of the land are very unhealthy.†

With the exception of the Gulf of Papua, British New Guinea is not so favoured in its coast lines: its Harbours appear to be distinctly inferior in value to those of the Dutch division of the island; and the coast is said also to be greatly encumbered with coral reefs. But with the exception of Astrolabe Bay, Humboldt Bay, and Huan Gulf, German New Guinea possesses a coast line which seems less valuable than either of the two other political divisions of the island.

The four important islands at the south-west and western extremity of New Guinea, together with a number of smaller ones, give us an idea of the much greater extent of this country in the remote part; for they take us nearly 100 miles farther to the north-west (or the W. of Mysol), and quite as much farther north (or the N. coast of Waigieu). The principal islands thus included are also Salawatti, Batanta, Koffian, Gamu (a satellite of Waigieu), and perhaps Popa, about the same distance from Salawatti as Mysol is. The shallowness of the seas separating these portions of land, and the similarity of their fauna and flora in general character fairly justify this conclusion. In all these districts the Fauna are very rich and remarkable for their beauty—much richer than Wallace, in his time supposed them to be; for later explorers and naturalists have been able, not only among the Birds of Paradise, and Pigeons, but among other families of birds, and among all orders of insects, especially Coleoptera and Lepidoptera, to add very largely to our knowledge of their productions—almost beyond the dreams of the greatest enthusiast. The island of Batanta is very lofty; but the isle of Jobi in Geelvink Bay, which resembles it in shape, though it is $2\frac{1}{2}$ times as long, possesses mountains of 2,000 and 2,500 feet in altitude. Batanta is well clothed with dense forest; and is a locality for the King Bird of Paradise and a large species of Cassowary. As the south coast of Batanta is so densely clothed with jungle, insects are few; and no Ornithoptera appear to have been taken there. The northern part, however, yields Wilson's Bird of Paradise, as does Waigieu also; and the Red Bird of Paradise. At Momos, on the south coast of Waigieu, Ornithoptera of a species belonging to the green groups are plentiful, but very difficult to capture, owing to the rapid pace at which they dash through the woods, and the density of the vegetation by which the collector is hampered. The Pigeons and Parrots of this district, as in other parts of New Guinea are very numerous.

Momos is situated to the east of Chabral Bay, a narrow gulf running into this part of the island of Waigieu so far (about 26 miles) as to cut the island nearly in two—somewhat in the same manner as the McCluer inlet nearly divides the Arfak, or N. Western portion of New Guinea from the remaining parts of the Dutch territory—for the two parts of the island are only united by about $3\frac{1}{2}$ miles of land. Just within the entrance to this gulf or inlet is a large number of rocks and islets extending for a couple of miles. Towards its northern extremity is another similar group. These all rise from the calm water perpendicularly within coralline cliffs, and are mostly clad with dense jungle; and the whole district is singularly rich and varied in its splendid fern and other vegetation.

The islands of Batanta and Waigieu, though many miles farther apart than are Batanta and Salawatti, nevertheless appear to possess a fauna almost common to each; while that of Salawatti does not furnish many of the forms found on the other islands—although Batanta is only about 2 miles, at its nearest point from Salawatti, and 25 miles from the nearest point of Waigieu. The sea which separates Batanta from Salawatti is deep; but shallow between the former and its more distant neighbour Waigieu. The geological reasons therefore for such unexpected zoological differences in the islands are obvious.

*No other Mountains in tropical Asia attain this limit.

†The coast settlements of Dutch New Guinea, which are few, must however be very difficult for Europeans to live in. The Dutch established a settlement at Triton Bay, on the south side of the island in 1828; but found it necessary to abandon it after seven years of trial.

Until recently Waigieu was considered to be the home of *Sch. Tithonus*; and the examples of the ♀ which reached England were believed to be the representatives of De Haan's type ♀, and the ♂ to be their proper mates. These forms are figured in my Pl. V. of this work; but since that plate was published Mr. Doherty discovered the species at Kapaur in New Guinea, on the western coast of the province of Onin, at least 340 miles south-east of Waigieu as the crow flies, and separated from its first habitat by two islands, the whole of the Arfak part of New Guinea, and the McCluer inlet. The females of this form of *Tithonus* Mr. Rothschild considers to be true representatives of the original type ♀: so that the two sexes of the Kapaur examples must be considered distinct from the Waigieu examples; and that at any rate the Waigieu females belong to a different though closely allied species. This new form he has called *T. Tithonus tithonus*. Be this opinion correct or not, the discovery of the species in such a new locality opens up very interesting possibilities for the future. These splendid vars. of *Tithonus* will be found figured on Pl. VI_A of this work, and a description of them in its proper place. A variety of the ♀ *Sch. Paradisea* has been taken at Etna Bay, on the north-west coast of Dutch New Guinea, and a little south-east of Triton Bay, or near the foot of the Charles Louis Mountains, or about 150 miles S.S.-East of Kapaur. This fine variety is named *flavescens* by Mr. Rothschild; and will be found figured in Pl. VA. A second var. *SCH. PARADISEA, v. Meridionalis*, Rothschild, is found at Mailu, British New Guinea. This form is much smaller than the last named, and differs much in the extent and shape of the light markings of the primary wings, and the light area of the secondaries; but the general colour is similar to that of *flavescens*. A third var. of the ♀ from Erima on the German east coast of New Guinea, in Astrolabe Bay, north of Constantine Harbour is called by Mr. Rothschild, *v. punctata*. This form may well prove ultimately to be the ♀ of a very distinct species of *Schoenbergia*, as it differs in many respects from any of the other forms—both in outline of wings, the markings of the primary wings, and the general colour, both of the body and wings: the dark portions of the latter being a warm red-brown on both surfaces—instead of the intensely black-brown of the other varieties; and the body and the light markings an ochraceous creamy-white, instead of the vivid whiteness of the wing marks of those varieties. [See Pl. VA. and descriptions.] These splendid forms therefore give promise of the probability that many new and fine vars. and species of the Genus *Schoenbergia* will yet be discovered, when New Guinea is more fully explored; and that the great island will prove as famous for, and rich in this most superb of all groups of butterflies (a group that may well be called THE BUTTERFLIES OF PARADISE) as it is in that most wonderful of all groups of birds, the *Paradisæideæ*, or BIRDS OF PARADISE.

NOTE.—When writing the portion of this article on the genus *DRURYA* I overlooked the contents of an interesting letter containing valuable information on the localities in which the two species of that genus have been taken on the Congo and in other parts of West Africa, most obligingly sent me in 1898 by Herr Wenig, director of the Musée Royal d'Histoire de Belgique, at Brussels, and which for many months I had unfortunately mislaid; but I now take this opportunity of printing the list of these localities in this place, rather than in a special appendix, to which I add the latitude and longitude of each place *approximately* only—though the determinations will not be far out, I think. I will also take this opportunity to thank Herr Wenig for the trouble he so courteously took to send me the information which I required on this point.

I. LOCALITIES FOR *D. Antimachus*, ♂.

The river Kassai and its tributaries, 20° E. long., 12° 40' S. lat. (Taken by M. Thys.)

Stanley Falls, 20° 26' E. long., 1° N. lat. (Clement de St. Nearey.)

Popokalaka. (M. Lerman.) Not yet included in the latest maps.

River Mongalla, a branch of the Congo, 21° E. long., 2° 30' N. lat. (M. Waelbroeck.)

Ibembo, on the north bank of the Congo, 22° 40' E. long., and 2° N. lat. (MM. F. Duviries and G. Desmet.)

Bangala, 18° 30' E. long., and 1° 45' N. lat. (M. Duviries.)

Bumba, 22° 18' E. long., 2° 14' N. lat. (M. Keyres.)

Upoto, 21° 55' E. long., and 2° 15' N. lat.; on the great Congo. (M. Wilwerth.)

Abon, Mombazi river, 31° E. long., and 4° 40' S. lat. (M. Valeriola.) This point is about 1 degree S. of Lake Taganyika.

Luluaberg. 21° 40' E. long., 5° 50' S. lat., situated on a portion of the Lulua River, and in a hilly district of the maximum altitude of 1815 feet. (M. Ch. Haas.)

A-Madi, 27° E. long., and 3° 28' N. lat. (M. Walhousen.)

Zengo Rapids, Mokoanghai, 19° 20' E. long., and 4° 18' N. lat. (M. Tilkens.)

Imlu Iboko. (M. Brunfaut.) Not yet included in the latest maps.

Banzyville, Congo river, $21^{\circ} 30'$ E. long., and $4^{\circ} 18'$ N. lat. (M. Herman.)

1895. Mompeno, on excrements found on the banks of rivers July 1st, 10th, 15th, 20th, 30th, August 1st, and 16th, (M. Rosen.)

Kassai, $20^{\circ} 0'$ E. long. (on the banks of this river) and $11^{\circ} 15'$ South East. (M. Boulenger.)

Umangi, on the north bank of the Congo, close to Upoto, in $21^{\circ} 37'$ E. long., and $2^{\circ} 7'$ N. lat. (M. E. Wilwerth.)
September and November, 1896.

Boko, $15^{\circ} 5'$ E. long. and $5^{\circ} 12'$ N. lat. (M. Moreels.)

Irenga, $33^{\circ} 20'$ E. long., $4^{\circ} 40'$ N. lat. (M. de Weire.)

On the Maringa River (a branch of the Lulonga River, itself an arm of the Congo), situated about $1^{\circ} 35'$ south of the Congo in 22° E. long., and $0^{\circ} 15'$ N. lat. (M. Mairesse.)

Kassai. (M. Boulange.)

Haut Maringa. (M. Mairesse.)

DRURYA *Zalmoxis*.

Kassai. (M. Thys.)

Bumba, $22^{\circ} 30'$ E. long., $2^{\circ} 10'$ N. lat.; north bank of the Congo. (M. de Keyres.)

Gabon, $4^{\circ} 36'$ E. long., $0^{\circ} 30'$ N. lat. (M. T. Carradot.)

Abon, Mombasi River. (M. de Valeriola.)

Bassan Kussu, south bank of the Congo, $19^{\circ} 45'$ E. long., $1^{\circ} 10'$ N. lat. (M. Cambier.)

Luluaberg. (M. Ch. Haas.)

Ibembo. (M. Desmet.)

Bangasso, $23^{\circ} 32'$ E. long., $4^{\circ} 50'$ N. lat. (M. Herman.)

Imlu Iboko. (M. Brunfaut.)

A-Madi. (M. Walhousen.)

Banzyville. (M. G. Herman.)

Zengo, Mokoanghay. (M. Tilkens.)

Mompeno (on excrements on the banks of the rivers, June 23, July 1, 10, 17, 30, August 10, 1895).

Bena Bendi, $20^{\circ} 41'$ E. long., $4^{\circ} 15'$ S. lat. (M. Cloetens.)

Boko. (M. Moreels.)

Irenga. (M. de Weire.)

Haut Maringa. (M. Mairesse.)

GREEN VARIETY OF *Zalmoxis*.

Mongalla. (M. Waelbroeck.)

GRAY VARIETY OF *Zalmoxis*.

Bangala. (M. Verhas.)

Kassai. (M. Boulenger.)

Umangi. (M. Wilwerth), September and November, 1896.

Whilst the foregoing latitudes and longitudes are not measured to a second, I believe they are generally within a mile or less than a mile of the localities named. One or two places are not yet to be found in the latest maps, and therefore the *exact* position could not be given.

THE GENUS ORNITHOPTERA.

At the head of the genus Ornithoptera is the type species, *O. Priamus*—a grand form from which all the numerous, so-called species, varieties and aberrations, included within the black and green groups, and also the black and violet, and black and yellow-red forms have probably been originated. If this is really the *original* type form, it would seem to have steadily maintained its position in a comparatively limited region, while its offshoots have gradually spread in every direction over an immense extent of the Eastern world—including portions of New Guinea and Australia and New Britain. But *Priamus* (type) has not, so far as I can trace, been taken in any locality beyond what may be called the Ceram Archipelago, including the Ceram Laut Islands, and I possess a specimen of the ♂ said to have been taken in the fairly large island of Buru or Bouru, as Wallace spells it, which is situated at some distance to the west of Ceram.

At present therefore we have these localities recorded for *Priamus*, viz.: Amboyna, Ceram, Ceram Laut, Buru, and Saparua; but as regards the largest island there appears to be no definite information as to the exact districts of Ceram where the examples of the insect have been taken, which is much to be regretted. However, such information may yet be obtained: in which case it will be included in one of the appendices to the 2nd vol. of this work.

Amboina (or Amboyna as it is often spelled), which the Malays call the island of Ambun, is the locality from which the majority of the specimens have been brought. It is a small island about 32 miles long and 10 miles broad, situated in S. lat. 3° 40' and between 128° and 129° E. longitude. It lies south-west of the large island of Ceram, and east of the island of Buru. It is so near to Ceram as to be, at its nearest point, not more than 4 or 5 miles from the opposite coast; and there is little doubt that originally Ceram, Amboina, with the intervening islands, and Buru were all connected. Like so many of the islands of the Eastern Archipelago, it is very irregular in shape for so small a mass of land—being indented by a bay so deep that the island is almost divided into two portions, which at the head of this bay are only united by a narrow isthmus. These portions are unequal in area—that to the north-west, which is called Hitoe, comprising fully 2-3rds of the island. Leytimor is the name of the remaining third. Within the strait between Amboina and Ceram, or to the north of Amboina, are 3 small islands, Saparua or Saparoua, where *Priamus* has been taken, Oma and Harocha. The Bay of Amboyna is 15 miles long from its entrance, but while its breadth varies considerably, it is in some parts not more than a mile across. Like Buru and Ceram it is a very mountainous and wooded country, and is drained by several small rivers, which during the season of excessive rainfall, are so swollen as to form mighty torrents, which overflow their banks, and sweep everything away that is met with in their furious progress. In the dry season these rivers become so shallow as to be not more than 2 or 3 feet deep. The most important of these streams originate in the mountains of Leytimor on the eastern part of the island. The arboreal wealth of the island is so great that Rumphius, the great naturalist, was able to account for over 400 different species—but very little of this timber is of much value for the more useful purposes. The trees and underwood, in their possession of the rich, loamy red soil of the island, are only limited by the numerous clove plantations cultivated by the Dutch Government and private enterprise. Formerly the Government took the entire responsibility and profit of this cultivation, making the growth of the clove a monopoly even for the island; compelling the inhabitants of the other islands of the Moluccas to destroy every plant under heavy penalties, in order that this unwise and tyrannical monopoly for Amboina should be secured. At the present time, however, both the Government and private speculators cultivate this valuable spice plant in several of the neighbouring islands, as well as in Java. Amboyna is fairly healthy, notwithstanding the heavy rainfall—the temperature being so equable as to average only from 72° to 82° fahr.

Amboyna produces all the vegetables and fruits common to the Eastern Archipelago; in its woods deer and wild hogs abound. Its coasts are rich in shells, many of them large in size, splendid in colour, and beautiful in form. The seas are also famous for their zoological wealth generally: sponges, corals, actiniae, and fishes of unimaginable colour, form, and dimensions, abounding. Dr. Bleeker has recorded 780 species of fishes as having been discovered in and around the island. On land the most remarkable of the bird fauna is the great Black Cockatoo, *Microglossus aterrimus* of Gmelin. By means of the island of Saparua continuous line of locality to Ceram is assured for *O. Priamus*. No doubt the species may some day be taken, if it has not been before, in the neighbouring islets of Oma and Haroche. It is impossible to say how far this species ranges over Ceram—as our specimens are not carefully labelled with their proper localities. Ceram is a mountainous country—for a great chain forms its vertebra, running through the centre of the island from east to west, a length of about 185 miles, its highest point being more than 7,000 feet above sea level. This mountain chain might prove a barrier to the existence of *Priamus* on some parts of Ceram. The average width of the island is about 30 miles. Whilst Amboyna produces three species of Ornithoptera, besides many of the noblest butterflies and beetles in the world, Ceram is *apparently* much less rich in these forms of animal life, according to the experience of Mr. Wallace—though many fine things must have been taken in the island; and only a very small proportion of its insect fauna can yet have been discovered.

Ceram is the largest of the Molucca islands with one exception (that of Gilolo); though not so strangely irregular in shape as the latter. Its average breadth is about 30 miles; and were it not for the peninsula of Hoewamochil, or little Ceram—its form would present very little novelty from that of any ordinary island. This peninsula is united at its western extremity by a narrow, irregularly-curved isthmus, called the Pass of Tamoeno. There is little doubt that Amboina was once a continuation of this neck of land. A group of 3 small islets flanks this land on the west. At the east end of the island is the cluster called the Ceram Laut Islands. The soil in the valley is as usual very fertile; and the peninsula at one time was abundant in its production of cloves and nutmegs, which were destroyed by the Dutch in 1657. The island also is famous for its forests of the Sago Palm.

According to Ribbe, in the *Iris* for 1889, p. 197, Ceram is rich in species of Ornithoptera and Papilios: there are, he says, 10 species of Ornithoptera and 58 of Papilios to be found in Great Ceram, the former includes several of the genus Pompeoptera. It is an island rich in Coleoptera, among them being many fine Longicornia. To the north of Ceram, with a slight inclination to the west, and situated due west of one of the arms of Gilolo, is the island of Batjan, or as it is variously spelled Batjan, and Batchian, the northern end of which reaches almost to the equatorial line. The length of the island from N.-West to S.-East is about 50 miles, with a width at its widest part of probably from 18 to 20 miles. Two small islands, Mandioli and Kasiruta with several islets flank Batjan on the west, and are continued by a line of islets as far Ternate, flanking the northern arm of Gilolo. Within this row of islets are Tawali, Makjan, and Tidore—all of them good hunting grounds for insects and birds; about 15 miles across the strait from Makjan is the island of Kaióa, a country so wonderfully rich in insects as to have fairly amazed and delighted Wallace. The landing place on this island he tells us "is a beach of hard coralline rock, with rugged cliffs of the same, resembling those of the Ké Island," accompanied by a brilliancy and luxuriance of the vegetation like what he had observed in the latter islands. The land in the part of the island where he stayed is gradually sinking; but when he reached an elevation of 200 feet on the forest clad line above the village where he stayed, the coralline rock was succeeded by a hard crystalline rock—a kind of metamorphic sandstone,—indicative of a recent elevation of more than 200 feet, which had still more recently changed into a movement of subsidence. This is not to be wondered at, for all these districts must be in a very unstable condition—judging by the almost universal evidences of volcanic action, and the terrible volcanic explosions that seem to occur at long intervals. In a new clearing beyond the swamp near the village—the insect life was extraordinary. Mr. Wallace never visited a place so rich in beetles—a dozen species of large Buprestidae, green rose-chafers (*Lomaptera*), and long-horned beetles (*Anthribidae*) were so abundant that they rose up in swarms as he walked along, filling the air with a buzzing hum. Several fine Longicorns were equally common. In three days at this spot he took about 100 species, among which were 42 species of Longicorns. Butterflies and Birds were not, however, so numerous. Of Birds a great red parrot *Electus Grandis*, a Crow, a Megapodius, or mound-builder, and the Racquet-tailed Kingfisher were the principal species met with.

To return to Batjan: the capital (the village or town) is built on the head of a wide and deep bay: a range of mountains forms the backbone of the island—the southern portion of this range being fine and lofty. The northern and southern parts of the island are connected by a rather narrow isthmus; but the northern part of the island is the broadest. The geological formation of the rocks, as far as Wallace could see the coast was either in thin layers of sandstone, or a pebbly conglomerate—sometimes a little coralline limestone, but no volcanic rocks. The forest was much more dense in its luxuriance and loftiness than those of Ternate and Gilolo, where dry and porous lavas and raised coral reefs abound. Gigantic tree-ferns are abundant in the forest, and the variety of vegetation is very great. In this forest are to be found the extraordinary Bird of Paradise, *Semioptera Wallacei*, Gray, or Wallace's Standard Wing; a green parrot with a red bill and head, *Geoffryus Cyanicollis*; two handsome fruit pigeons with metallic green, ashy, and rufous plumage; the deep-blue Roller, *Eurystomus azureus*; the Golden-capped Sunbird, *Nectarinea Auriceps*, and a Racquet-tailed Kingfisher, *Tanyptera isis*. Among butterflies is a species of Papilio, closely allied to the magnificent blue and black *P. Ulysses* but with the blue still more intense, and a row of blue stripes around the margin of the posterior wings to accentuate the veinlets; also a lovely and delicate *Lycæna* (*Damnis Sebæ of Boisduval*), with wings of rich metallic blue and white, and many handsome species of Papilios, Pieridæ, and Euplœas. Coleoptera are abundant, among them some fine Longicorns. The interior of Batjan, which has no indigenous people, is altogether uninhabited; and only a few small villages were built along the coast. In this forest Wallace first saw the ♀ of *Cræsus*, and two months later the ♂. This species flies at a great height, and is very wild and swift in its movement; but being attracted to the yellow flowers of a shrub, a species of *Mussaenda*, he at length succeeded in taking it, as described at page 33 of this vol.

Since then *Cræsus* has been discovered in Ternate, Djilolo, and (bred) in Amboina. Besides this wonderful species the allied form *Lydius* with its curiously abnormal ♀ occurs in Djilolo or Gilolo, and perhaps in Batjan; likewise several species of *Lycænidæ*, the fine *Papilio Wallacei*, of Hewitson—a lovely insect closely allied to the Agamemnon group of swallow-tailed butterflies—an Aru Island species also occurs. But altogether by comparison with other localities the forests of Batjan are rather poor in species and individuals of bird and insect life, though Wallace met with one or two species in almost every class or order conspicuous for their extreme beauty or singularity of form.

But, taking a long leap for the present to continental Australia, which also may be called the largest island in the world, we shall meet with a greater abundance of Ornithoptera, especially at the northern portion of this immense country—while right on into New Guinea, the next largest tract of insulated land on earth, we have a whole province of beautiful Ornithopterous forms, as magnificent and remarkable, or more so, as any to be found in the Moluccas, even including *Priamus* and *Cræsus*. Two species or forms of Ornithoptera are inhabitants of the former country—which are closely,—very closely, allied; these are *O. Richmondia* and *O. Cassandra*.

The first of these inhabits the district through which the Richmond River flows—a river which takes its origin among the Macpherson Range of mountains somewhere near Mount Lindsay (which is 3,500 feet high) and in its winding and erratic course, and by means of its branches, travels to Lismore, and also flows into the sea at Ballina. Mount Lindsay is situated about 153° E. long., and about 27° 20' S. lat.; the Richmond River descends as low as 29° 8' lat., but finally empties itself into the ocean at about 27° 50' S. lat. The whole of the coast-land from the Clarence River to the Macpherson Range is exceedingly mountainous. In this portion of New South Wales *O. Richmondia* is very plentiful: it is common on all the northern rivers of N. S. Wales till we reach Clarence River, nearly 2-3rds of a degree farther south, below which it is not found very far. At Lismore it is common. It extends also into southern Queensland, but how far it is not easy to say. Altogether however it appears to have a wide range in mountainous and also more level country. The *Cassandra* (or *Euphorion* form, as it is called by Miskin) is the common species of Queensland,

inhabiting a tract of territory from Mackay and the Pioneer River on the East Coast of Australia (about $21^{\circ} 15'$ S. lat., and $149^{\circ} 15'$ E. longitude), to Cooktown, near the Norma River, (in about $15^{\circ} 20'$ S. lat., and $143^{\circ} 15'$ E. long.) or within a line of coast at least of 380 miles from north to south. It has been taken plentifully at Cairns on the Russell River, about 68 miles north of Cooktown; at Port Denison 200 miles N.E. of Cairns; on the Border River, 60 or 70 miles inland in a westerly direction; and on the Herbert River which empties itself into the sea at the head of Halifax Bay. It has been received from parts of N. S. Wales as well as Queensland—and its northern limit is the Maroochy River. But we may safely assume that its range would extend inland west to many degrees of longitude, probably through the whole of Queensland. Specimens which come to us from such a large territory, of which the coast is the most thickly populated, naturally will have been chiefly taken in tracts of land most accessible.

The third species of Ornithoptera found in Australia is confined to the more extreme northern part of the Continent, where the climate and vegetation become more tropical in character. This is *O. Poseidon*, of which its var. *Pronomus* is found at Cape York and Thursday Island, and the type form *Poseidon* on Darnley Island, between N. Australia and New Guinea. On the Cape York Peninsula, under its name of *Pronomus*, it will probably range over at least 4 degrees of latitude, but it has not been found on the opposite or west side of the Gulf of Carpentaria, or North Australia, so far as I am aware. *Euphorion* or *Cassandra* has, however, on the authority of Gray, been brought from the N.W. coast and N. of the Continent. Thursday Island is a small but important islet about 18 or 20 miles N. N.-West of the most northern point of the Australian continent—Cape York. Prince of Wales Island, comes, with Horn islet between Thursday Island and the mainland, and the sea beyond to New Guinea is fairly dotted with islets and specks of land—many of which may be stages in the distribution of such a varying but strong species as *Poseidon*. When the two masses of land were joined, as they must have been long before those land specks were formed, probably *Poseidon* was dominant over a large part of Australia and New Guinea, but the present local forms did not exist. Under a variety of names, the males only slightly differing from each other as a rule, but the females presenting every gradation of variation, *O. Poseidon* has an immense geographical range; for we meet with important local forms in the most widely separated regions. The var. *Pegasus*, Kirsch, is found at Humboldt Bay in New Guinea, just within the Dutch territory, in $2^{\circ} 37'$ S. lat., and $140^{\circ} 45'$ E. longitude; in the D'Entrecasteaux Islands, and Possession Bay; In Kei or Evar Island—a long narrow line of insulated land, extending from N.E. to S.W., and situated about 72 miles S.S.E. of the south coast of New Guinea in about $5^{\circ} 18'$ to $6^{\circ} 3'$ S. lat., and $132^{\circ} 18'$ to $132^{\circ} 50'$ E. long., or thereabout. Great Kei Island or Nuhu Yut is not more than 7 miles wide, and about 50 miles long: it is flanked on its lower western side by Little Kei Island, and a group of still more westerly specks, such as Kei Tenimber Island, where I think *Poseidon* has been taken, Tual, and Nubu Roa, &c. The variety *Hecuba*, Röber, inhabits Kei Island.

From 75 to 80 miles east of this group are the Aru Islands, where, especially on Wokam, we obtain *Aruana* and the green *Bornemannii* var. of *Urvilliana*; the *Aruana* var. *Valentina* of Vuillot occurs at Port Moresby, on the western side of Brit. New Guinea and again in New Britain. Varietal forms of *Poseidon* are also found in Waigeu (the *Kirschi* representatives of *Pegasus*); it is also obtained from Salawatti; from the Arfak Mountains of New Guinea; from Duke of York Island; from Torres Straits, sometimes like *Aruana*; from the Aru Islands under Felder's name of *Oceanus*; from Stevensort in New Guinea; from Fergusson Island (the *Archideus* of Gray); from Aru under the name *Eumæus*; in New Guinea under the name of *Cronius*; from Rawak under the name of *Triton*; from Woodlark Island under the name of *Boisdwali*; and others from the Louisiade Archipelago and D'Entrecasteaux Islands, and Kiriwina in the Trobriand Archipelago, East of southern New Guinea. It may be that many more localities might be cited for this very variable species; but I will leave that to the final geographical table at the end of the 2nd vol. of this monograph.

Ornithoptera Urvilliana has a fairly extensive range: being found in New Britain, New Ireland, (Port Praslin), New Guinea, the Solomon Islands (Aola, Fauro, Guadalcanar, &c.), and [under the variety name of *Cælestis*, described by Mr. Rothschild in his "Novitates Zoologicae," Vol. V., p. 216, n. 1 (1898), as a subspecies], at St. Aignan (or *Misomay*) Island, the most south-western of the Louisiade Archipelago. In these localities the green tinted, or distinctly green forms are found chiefly in the islands of the Bismark Archipelago, where the σ & ρ at least are difficult to separate from those of *Aruana*; and the blue and violet in the Louisiade Archipelago, where they are distinctly smaller than the type, and in the Solomon Islands and New Guinea. Thus in this brief and necessarily imperfect review of the distribution of the forms of the Genus *Ornithoptera*, as I have restricted it, we may, if we please, feel quite justified in regarding *Ornithoptera* as really *one species* with a number of named varieties, (yet probably to be considerably augmented), which has spread over an enormous extent of the East, from the Molucca Islands to New Guinea, thence eastward and south-eastward to the Solomon Islands, north-eastward to the Bismark Archipelago; and north, right away to the very heart of Australia; but the strongest fact is that the western, and ultra eastern forms really most closely resemble each other, viz., the type form *Priamus* of Amboina and the *Richmondia* form of Australia.

This suggests therefore that the least amount of variation from the original type took place during the southern spread of the species, while the tendency was for the species to become smaller as it progressed in its southern migrations; at the same time as it progressed north and eastward an extraordinary amount of variation was accomplished—the full extent of which we are not yet fully acquainted with. A further indication of this fact is that neither *Priamus* of Amboina, nor *Cassandra* (*Euphorion*), or *Richmondia* of Australia vary to any extent in their own localities; while of the branching streams the endless amount of instability has been the cause of so many species having been founded.

THE GENUS ÆTHEOPTERA.

All the species or varieties of this genus appear to be confined to the Solomon Archipelago—an extensive group of islands extending from N.W. to S.E. between 5° and $10^{\circ} 50'$ of south latitudes and $154^{\circ} 35'$ and $162^{\circ} 25'$ of east longitude, that is nearly 600 miles long, and about 130 miles wide at its greatest breadth. The most northern island of this group is Buka Island, with a mountain 1312 feet high, and a number of small islets on its west side; the next is Bougainville Isle, about 100 miles long and about 35 or 40 wide. Bougainville possesses two mountain ranges of an extensive character, the Emperor and Crown Prince Range, rising to 7743 feet; next comes the small Shortland Islet, and the Fauro group in Bougainville Straits, after which the Archipelago consists of two lines of islands running parallel on their way south-east, with a wide sea channel between them. The south-western line consists of 6 fair sized islands, including Lavella, Marovo or New Georgia, Guadalcanar or Gela, 75 long and 60 wide, with mountains 8005 and 5151 feet high, and San Cristoval (or Bauro, Aurossi) with a number of islets still further S.E. New Georgia is flanked on its western side with several curiously-shaped islands such as Montgomery, Rendowa, Wana Wana,—and more N.W.,—Gizo, Novoro, Bagga and Ronongo Islands. On the N.E. side there are three very important islands—Choiseul, 80 miles long, and about $7\frac{1}{2}$ wide, greatest height 1640 feet, followed by an archipelago of low islets; then Isabel (or Bogotu) Island about 102 miles long and 15 wide, with mountains of 2428 and 2050 feet high; then Florida group and the Island of Malaita or Malanta, which with its separated tract at the S.E. end measures about 100 miles in length, but not more than 20 miles in width. Its highest mountains rise to 4265 feet. Guadalcanar and Bougainville therefore own the highest points of land in the group. At present these islands are not very safe to penetrate, in consequence of the hostility of the natives, some of whom are alleged to be cannibals. When, however, they have been more fully explored, no doubt many new and splendid things will be discovered. As it is many of the butterflies are of great beauty; and at the head of these are the forms of *Ætheoptera Victoriae*.

Victoriae the type form occurs at Wanderer Bay, Guadalcanar, and on the north side of the island; *Reginae* inhabits the island of Maleita, N.W. Bay, and *Regis* is found in Bougainville Island. *Victoriae* also inhabits the Shortland Islets, the Rubiana Lagoon islets, and possibly New Georgia.

Additional information will probably be given in the conclusion of the Geographical Distribution Section, in Vol. II.

SUMMARY OF THE FOREGOING.

Localities where the species and varieties treated of in this Vol. have been taken.

1. GENUS DRURYA.

<i>D. Antimachus</i>	Sierra Leone. Old Calabar. The Gaboon. Ambas Bay. Sherboro' River. Egowe River (French Congo). Yambuya (Aruwimi River). Upoto (Congo). Stanley Falls. [Also for other localities, see pp. 72, 73.]
<i>D. Zalmoxis</i>	Calabar. Angola. St. Paulo de Loanda. [Also see page 73 for other localities.]

2. GENUS SCHÆNBERGIA.

<i>Sch. Paradisea</i>	Sattleberg, (Finisterre Mountains, German New Guinea).
var. <i>Flavescens</i>	Etna Bay, (Dutch New Guinea).
var. <i>Punctata</i>	Erima, Astrolabe Bay.
<i>Sch. Meridionalis</i>	Mailu, British N. Guinea.

<i>Sch. Tithonus</i> , type	Kapaur, Dutch N. Guinea.
var. <i>Waiguensis</i>	Island of Waigeu.
<i>Sch. Goliath</i>	Kapaur, New Guinea.

3. GENUS ORNITHOPTERA	Amboina.
<i>O. Priamus</i>	Ceram. Ceram Laut. Buru ? or Bouru. Saparua.
<i>O. Cassandra</i>	Queensland, from Mackay to Cooktown. Cairns. Port Denison. Border River. Herbert River. Maroochy River. Bowen (mid-Australia). Rockhampton. Richmond River. From Clarence River to the Macpherson Range. On all the Northern Rivers to Clarence River. Lismore. Southern Queensland.
<i>O. Pegasus</i>	Western Coast of N. Guinea. Northern Coast of N. Guinea Humboldt Bay, Dutch N. Guinea. D'Entrecasteaux Islands. Possession Bay. Kei Island.

		Fergusson Island.		<i>O. Aruana</i>	Wokau.
		Island of Dorey.			Aru Islands.
var. <i>Kirschi</i>		Amberbaki, N. Guinea.			The Louisiade Archipelago.
		Mysol.			D'Entrecasteaux Islands.
		Salwatti, or <i>Salawatti</i> .			Kiriwina Island.
<i>O. Poseidon</i>		Darnley Island.			(Trobriand Archipelago.)
		Cape York, N. Australia.		Hypothetical var. <i>Valentina</i>	Port Moresby
		Torres Straits.		<i>O. Eumæus</i>	Aru Islands.
var. <i>Pronomus</i>		Cape York.		<i>O. (Priamoptera) Cræsus</i>	Batjan.
		Thursday Island.			Amboina ?
		Kei Tenimber Island ?		<i>O. (Priamoptera) Lydius</i>	Halmaheira.
		D'Entrecasteaux Islands.			Djilolo, or <i>Gilolo</i> .
		Dorey.		<i>O. (Priamoptera) Urvilli-</i>	
		Arfak Mountains.		<i>ana</i> (green forms)	Duke of York Island.
		Torres Straits.			New Ireland.
		Duke of York Island.		var. <i>Bornemannii</i>	New Britain.
		Wokau.		(blue forms)	Solomon Islands.
var. <i>Archideus</i>		Salwatti or <i>Salawatti</i> .			New Hanover.
		Waigeu.			Florida Isle, Aola, Guadal-
		New Guinea.			canar, Fauro Isle, (of the
var. <i>Euphorion</i>		N. W. Australia.			Solomon group).
		Russell River, near Cairns.			New Guinea.
		Port Denison.		var. <i>Cælestis</i>	Louisiade Archipelago.
		Queensland.			St. Aignan (<i>Misomay</i> Island).
Hypothetical var. <i>Cronius</i>		New Guinea.			
" "	<i>Triton</i>	Rawak.			
" "	<i>Boisduvali</i>	Woodlark Island		4. Genus <i>ÆTHEOPTERA</i>	Solomon Islands.
" "	<i>Hecuba</i>	Kei Island.		<i>Æ. Victoriae</i>	Guadalcanar.
" "	<i>Oceanus</i>	Aru Islands.		<i>Æ. Reginae</i>	Maleita (<i>nec</i> Fiji).
var. <i>Brunneus</i>		Stevensort, or <i>Stephensort</i> .		<i>Æ. Regis</i>	Bougainville.
		Fergusson Island.			

LIST OF AUTHORS

WHO HAVE WRITTEN ABOUT THE *GENERA*, *SPECIES*, OR *VARIETIES* CONTAINED IN
THIS VOLUME, WITH THE DATES OF MENTION:—

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- Butler. *O. Priamus*, 1869; *O. Cassandra*, 1873; *O. Tithonus*, 1874; *Poseidon*, 1874; *Victoria*, 1874; *Urvilliana*, 1874, 1879.
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- De Haan. *P. Tithonus*, 1841.
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- Esper. *Antimachus*, 1785, 1798; *O. Priamus*, 1784, 1786.
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- Houttuyn. *O. Priamus*, 1767.
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 1893, 1894; *Cræsus*, 1888; *Lydius*, 1888;
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- Thon. *O. Priamus*, 1888, 1837; *Poseidon*, 1828.
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- Tryon. *O. Poseidon*, 1892.
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Aruana, 1865; *O. Priamus*, 1846; *Poseidon*,
 1848.
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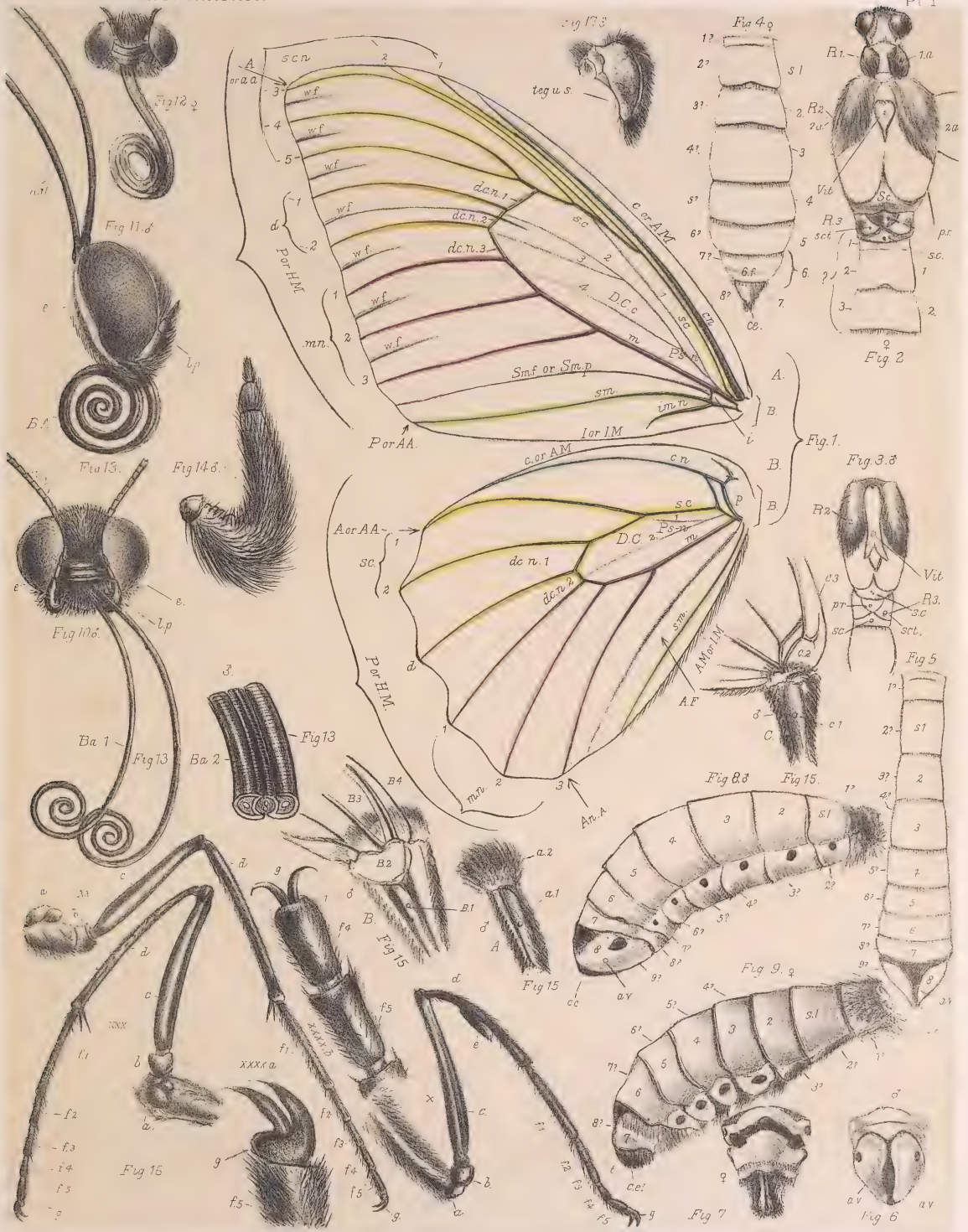
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- „ B.—Figs. 1, ♂, 2, ♀, neurulation of *O. Priamus*; 3, ♂, of *O. Aruana* (from wings denuded by the Waterhouse process); 4, ♀, 5, ♂, of *O. Cassandra*; 6, ♀, of *P. flavicollis*; 7, ♂, of *P. flavicollis*; 8, 8*a*, ♀, of *P. ruficollis*.
- „ D.—Figs. 1, ♂, 2, ♀, neurulation of *O. Eumæus*; 5, ♂, 11, ♀, of *O. Pegasus*; 3, ♂, 4, ♀, of *O. (P.) Lydius*; 7, ♂, 8, ♀, of *Pompeoptera Nereis*; 9, 9*a*, ♂, of *P. Melpomona*; 9*b*, ♂, abnormal neurulation of left hind wing; 10, ♀, neurulation of ♂.



Revised by H. F. Rippon del et lith. 1894.

M & N Hanhart imp

External Anatomical Characters of the true ORNITHOPTERA.





Robt. H. F. Rippon. del. et lit. h. 1894.

Hanhart imp.

DRURYIA ANTIMACHUS, *Drury and Aurix* 1, 2, ♂; 3, 4, ♀.
5, *Neuration of ♂.*



Robt HF Rippard del et lith. 1894.

M & N Hanhart imp

1.2. *DRURYA ANTIMACHUS* ♂ var. *Drury*, Auriv. 3. Neuration of ♀; 4. Mag. Fig. of head, ♂; 5a. spurs at base of tibia of Mesothoracic leg, lateral view; 5b. the tarsi &c seen from beneath; 5c. lateral view of unguis of ♂; 6a. Anterior leg, 6b. Secondary leg, 7. Anal valves &c of ♂; 8. Caudal extremity of ♀



Robt H.F. Rippon del et lith. 1896.

M&N. Harbart imp.

DRURYA ZALMOXIS Hew., 1, 2, ♂, 3, 4, ♂ var.; 2a neuraction; 2b prothoracic leg.



Robert H.F. Rippon, del. et. lith. 1899.

DRURYA ZALMOXIS, *Hew. Figs. 1, 2, 3, ♀*.

Hanhart imp.



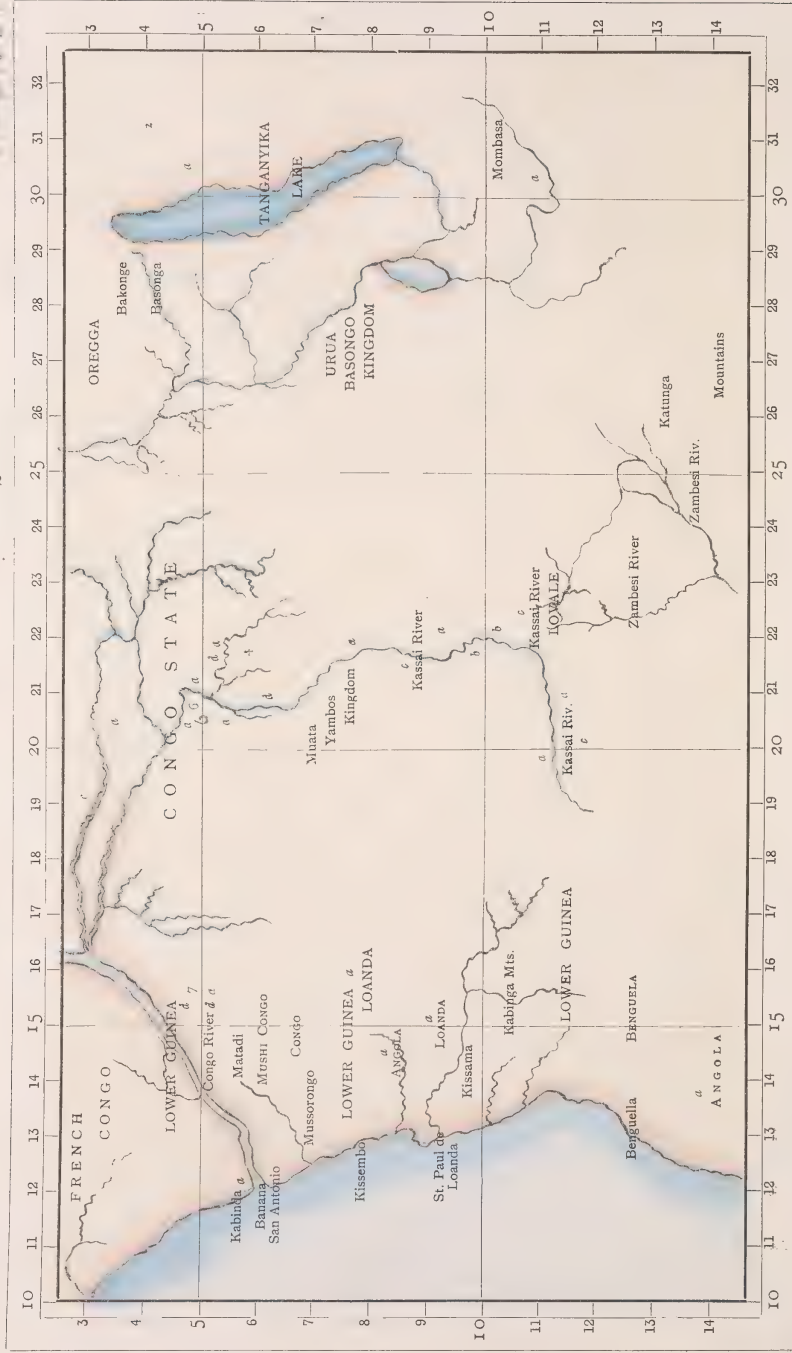
Geographical Distribution of Species of the Genus DRURYA of Aurivillius. SECTION I.

EXPLANATION OF THE LETTERS IN THIS MAP.

- a. Drurya Zalmoxis.
- b. „ green var.
- c. „ gray var.
- d. „ Antimachus.

SECTION 2.

FRENCH CONGO, SOUTH OF THE EQUATOR.



LONGITUDE EAST OF GREENWICH.



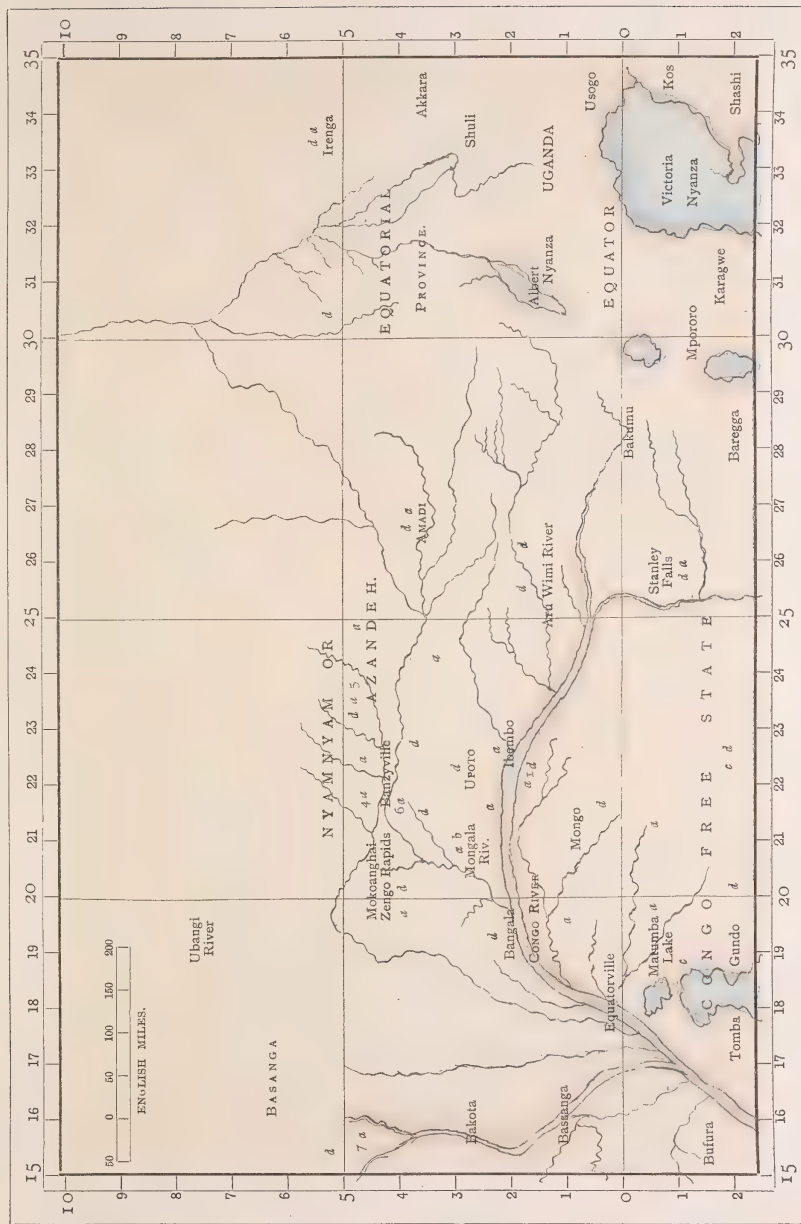
EXPLANATION OF THE LETTERS IN THIS MAP.

- a. Drurya Zalmoxis.
- b. " green var.
- c. " gray var.
- d. " Antimachus.

SECTION 3.

NORTH AND SOUTH-EAST CONGO.

MAP I OR PLATE 3. (1898)



EXPLANATION OF THE LETTERS IN THIS MAP.

- a. Drurya Zalmoxis.
- b. " green var.
- c. " gray var.
- d. " Antimachus.

NAMES OF LOCALITIES INDICATED BY NUMERALS.

- 1. Bumba.
- 2. Abon.
- 3. Bassan Kussu.
- 4. Luluaberg.
- 5. Bangasso.
- 6. Bena Bendi.
- 7. Boko.



Hab. H.F. Rippen del. lith 1894

M & N. H. A. A. A. A. A.

SCHOENBERGIA PARADISEA, Fagenstecher, and Stauder, 1, 2, ♂; 1^c, Neuration of ♂; 3, 4, ♀, 3^b, 3^c, Neuration of ♀; 1^b, Abdominal margin of ♂; 5, Anterior leg of ♀



Tab. II F. Rippon del. et lith., 1899.

Hanhart imp

SCHOENBERGIA PARADISEA, *Pagenstecher & Staudgr.*, 1, 1a, 2, var. *flavescens*, p. *W. Rothschild*, 3, 4, var. *meridionalis*, p. *W. Rothschild*, 5, 5a, 6, var. *punctata*, *Hagen*, p.



Robert H.F. Rippon, del et lith. 1899.

Hanhart imp

SCHOENBERGIA MERIDIONALIS, *Rochsch*. Figs, 1, 2, 2a, b, c, d.
SCH. GOLIATH. *Oberth*, 3, 4, vars. ♀.





Plat. H. Pap. p. 22 et 23. 1835.

M&N. Hanhart imp.

SCHOENBERGIA TITHONUS, De Haan, 1, 2, 3, 3♂, neuration; 3a abd. fold of ♂, 4, 5, 6, 6a, neuration.



Robt H F. Rippon del. et lith. 1899.

Hanhart imp.

SCHOENBERGIA TITHONUS, De Haan, (*tithonus*, type form ? Rothschild). 1, 2, ♂.
3, 4, ♀. (type form ? Rothschild).



R. W. Rippert del et lith. 1898.

M. N. Hanhart imp.

SCHOENBERGIA GOLIATH ♀, Oberthür Figs. 1, 2, 3, 4.



Robert H. E. Rippon del. et lith.

M & N. Hanhart imp.

1, 2, ORNITHOPTERA PRIAMUS, ♂ *inn.* (1a. ♂ *Sericeous patch*). 3, 4, ♂ *var.* (3b. *Sericeous patch*).
5. HEAD OF GEN. ORNITHOPTERA, *Seen from the front.*



Robert H.F. Rippon del et lith. (1890)

M.N. Hanhart in.

1, 2, ORNITHOPTERA PRIAMUS ♀, Linn.; 3, 4, Var., ♀.



Robert H. Knyon del et lith (1890)

M. & N. Hanhart imp.

1, 2. ORNITHOPTERA PRIAMUS ♀, Linn.; 3, 4. Var. ♀.



Robert H.P. Rippon del et lith.

M&N. Hanhart imp

1, 2, ORNITHOPTERA CASSANDRA, ♂, Scott's 1a, (♂ Sericeous patch). 3, 4, ♂ var.; (3♂, ♂ Ser. patch); 5, 6, ♂ var.; (5c, ♂ Ser. patch); 7, Costal band of var. of O. RICHMONDIA, ♂.



Robert H.F. Rippon. del. et lith. (1896)

M.H. Hantzsch. sculp.

1, 2. ORNITHOPTERA CASSANDRA ♀, Scott, 3, 4, Var. ♀.



Robert H F Rippon del. et lith. (1890)

M & N. Hanhart imp.

1, 2 ORNITHOPTERA CASSANDRA ♂, Scott; 3, 4, Var. ♀.

SECTION I.
 ICONES ORNITHOPTERORUM.

MOLUCCA ISLANDS.



LONGITUDE E. FROM GREENWICH.

Geographical Distribution of the Genus Ornithoptera; see also Map 3, Pl. 19A, for the range of the Genus from N.W. New Guinea to the Bismark Archipelago and Solomon Islands.

EXPLANATION OF THE LETTERS IN THIS MAP.

- a. *Schoenbergia Tithonus*, var. *Waiguensis*.
- b. *Ornithoptera Priamus*.
- c. " *Pegasus*, v. *Kirschi*.
- d. " (Priamoptera) *Cresus*.
- e. " " *Lydius*.
- f. " *Eumæus*.
- g. " *Poseidon*.

NAMES OF LOCALITIES INDICATED BY NUMBERS.

- 1. Halmahera.
- 2. Ternate.
- 3. Rubi.
- 4. Wajeji.
- 5. Banda I.



LONGITUDE E. OF GREENWICH.

EXPLANATION OF THE LETTERS IN THIS MAP.

- a. Ornithoptera *Cassandra* (or *Euphorion*).
 b. " *Richmondia*.
 c. " *Poseidon*.
 d. " " *var. Pronomus*.
 e. " " *var. Euphorion*.
 f. " *Aruana*, (Hypothetical *var.* *Valentina*).
 g. Ornithoptera (*Priamoptera*) *Cræsus*.

NAMES OF LOCALITIES INDICATED BY NUMBERS.

1. Darnley Island, Torres Straits.
 2. Cammerunga, Queensland.
 3. Maroochy River.
 4. Keppel Bay.
 5. Norman River.
 6. Albert River.
 7. Michell River.
 8. Flinders River.
 9. Investigator River.
 10. Port Stephens.
 11. Solitary Islands.
 12. Moreton Bay.
 13. Cape Moreton.
 14. Manor River.
 15. Burnet R.
 16. Cape Tribulation.



Robert H.P. Rippen del. et lith. 1989.

ORNITHOPTERA RICHMONDIA, Gray. 1a, 2, 3, 3b, 4, 5, 6q 6bq var
(a, a'; b, b'; c, c'; d, d'; e, e'; f, f'; g, g'; Refer to text).

M&N. Hanhart imp



Fels. H.F. Rippon. del. et lith. 1893.

M.N. Hanhart imp.

ORNITHOPTERA PEGASUS Felder. ♂ 1, 2; var ♂, 3; ♀, 4, 5 Subcostal band of ♂, 6; Sexual band ♂, 7.





Robt H F Rippon del et lith 1894.

Hshhart imp.

ORNITHOPTERA PEGASUS, *Feld. var.* 1, 2, ♂; 3, 4, ♀; *Abnormal var of ♂*, 5 (*See Appendix 1*)





R.H.F. Rippon del. et lith. 1898.

M&N. Hanhart imp.

ORNITHOPTERA PEGASUS, Feld. Var. ♀, Figs. 1, 2; Neuration, 3a, b.



Robert H.F. Rippon, del. et lith. 1898.

Hanhart imp.

ORNITHOPTERA POSEIDON, Doubt, Figs 1, 2♂; var PRONOMUS, Gray ♂, 3, 4♀ 5, 6, Stigmatic brand of Poseidon ♂, 7.





Robt H.F. Rippon, del et lith. 1899.

Hanhart imp.

ORNITHOPTERA POSEIDON. *p*, var. *Archideus* Figs. 1 and 1a; a second example, Fig. 2.



Robert H.F. Rippon, del. et lith. 1898.

Hanhart imp

ORNITHOPTERA POSEIDON ♂, Doubl, Figs 1, 2, var PRONOMUS, ♀,
 Gray 3, 4, upper and underside diagram of PRONOMUS, ♀ 5, 6,
 Neuration of Poseidon, ♀, ant. Wing, 7.



R.H.F. Rippon, del. et lith, 1898.

M&N. Hanhart imp.

ORNITHOPTERA POSEIDON, *Doubld. ♀, brunnea, Rothschild*, Figs. 1, 2;
Var. pronomus ♀, Gray; *normal Var. ♀, 4*.



Icon. Mus. B. p. - tel. 18. 18. 18.

VAN HANDEL 18.

ORNITHOPTERA AFRUANA, Felder, 1, 1a, 1b, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.



Robert H.F. Rippon del. Lith. 1891.

M. & N. Hanhart m. q.

O. ARRUANA, Feldt ♀ vars. 1, 2, 3, 6, ♂ var. 5; O. CASSANDRA, Scott, ♀ vars. 7, 8 O. PRIAMUS, Linn. vars. 9, 10, 11
 ABDOMINAL FOLD OF O. ARRUANA, ♀ 12. ABDOMINAL FOLD OF O. ARRUANA ♂, Dranz flat, 13.
 ABDOMINAL FOLD OF O. PRIAMUS ♂ 14. POMPEOPTERA flavicollis, Druce ♀ var. 4



Ed^d H.F. Rippon. del. et lith. 1892.

M&N. Harhart imp.

ORNITHOPTERA EUMÆUS, Rippon. 1, 2, ♂; 3, Costal band of ♂; 4, Sericeous Sexual patch of ♂; 5, 6, ♀.

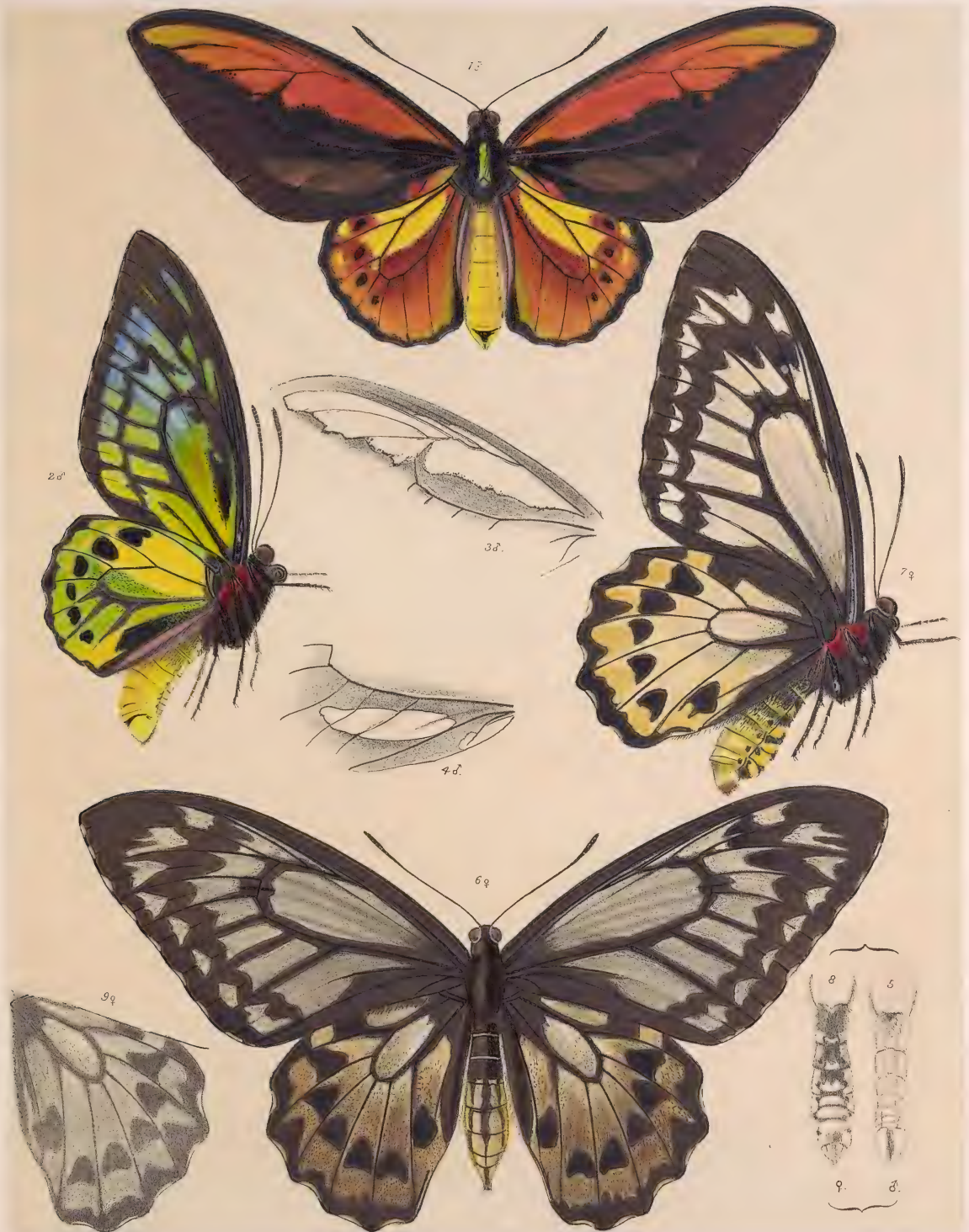




R.H.F. Rippon del et lith. 1897.

M&N. Harhart imp.

O. (PRIAMOPTERA) CRÆSUS ♂, Wall., Figs 1, 1a, subcostal band, 1b, Golden marks of h. w., 1c, neurulation of f. w. 1d, bred example; 2, colour reflections, 2a, Golden marks of h. w., 2b, Und. surface of ♂, 3, subcostal band of LYDIUS, 4.



Robt H.F. Rippon del et lith 1892.

M&N. Hanhart imp

O.(PRIAMOPTERA) LYDIUS, Felder. 1, 2. ♂; 3, Subcostal band of ♂, 4, Sexual brand of ♂; 5, Subdorsal of ♂, abdomen; 6, 7 ♀, 8 Subdorsal of ♀, abdomen; 9, left secondary wing,





Robt H.F. Rippon del et lith. 1896 .

M&N. Hanhart imp.

O. (PRIAMOPTERA) URVILLIANA Guér., 1, 2♂; 3, 4, 2a, 3, 4, forms of the ♂ stigmatic brand; 5, 6, ♀ vars .



Fig. 1-7. *Urvilliana* de Léc. 1896.

M&N. Harhart imp.

(PRIAMOPTERA) URVILLIANA, Guér. 1,2,3,4, vars. of the ♂; 5,6,7, vars. of the ♀; 8 subdorsum of abdomen, ♀.



Rebar: H.F. Rippon del. et lith. 1899.

Hannart imp.

O. (PRIAMOPTERA) URVILLIANA 1, 2, ♂ blue form; 3, 4, var. *bornemannii*, ♂ Pagenstr.
5♀; 6, 7, 8, 9 ♀ vars. of cell. marks.



Robert H.F. Rippon del et lith. 1899.

Hanhart imp

O. (PRIAMOPTERA) URVILLIANA, var COELESTIS, Rothschild, Fig. 12♂, 34♀.



Map of the Geographical Distribution of Species of the Genera *Schoenbergia*, *Ætheoptera*, and part of *Ornithoptera*.

EXPLANATION OF THE LETTERS IN THIS MAP.

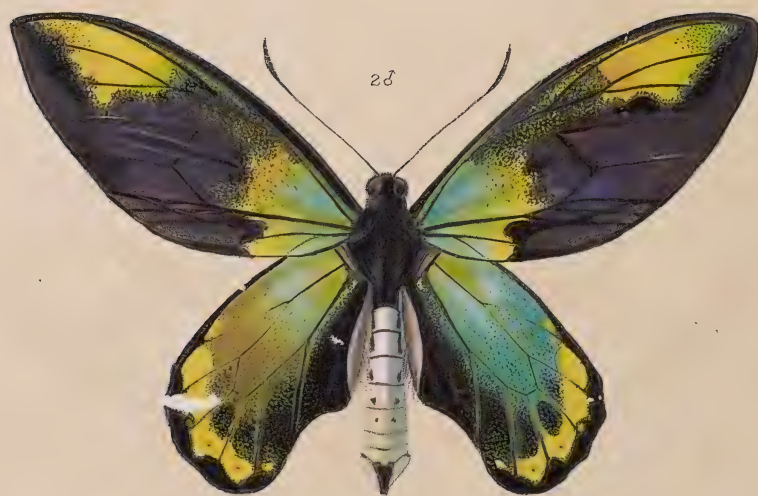
- a* *Schoenbergia* *Paradisea*.
b *Schoenbergia* *Paradisea*, v. *flavescens*.
c " " v. *punctata*.
d " Meridionalis.
e " Tithonus, type.
f " " v. *Waiguenensis*.
g " Goliath.
h *Ornithoptera* *Poseidon*, v. *pronomus*.
i " " v. *euphorion*.
j " " v. *brunneus*.
k " " v. *Boisdavalli*.
l " " v. *Hecuba*.
m " " v. *Oceanus*.

- n* *Ornithoptera* *Poseidon*, v. *Triton*.
o " " v. *Archideus*.
p " Aruana.
q " Eumæus.
r " Pegasus.
s " " v. *Kirschi*.
t " (*Priamoptera*) *Urvilliana*, (Green Forms).
u " " (Blue Forms).
v " " v. *Calestis*.
w *Ætheoptera* *Victoriae*.
x " *Reginæ*.
y " *Regis*.

NAMES OF LOCALITIES INDICATED BY NUMERALS.

1. Waigeu Island.
2. Amberbaken.
3. Arfak Mountains.
4. Jobi I.
5. Cape D'Urville.
6. Papua Talanjang.
7. Stephansort.
8. Maclay Coast.
9. Erima.
10. Astrolabe Bay, South side of the Island.
11. Port Moresby.
12. Possession Bay.
13. Mailu.
14. Fly River.
15. Strickland River.
16. Donaldson Mountains.
17. Kapaur.
18. Etna Bay.
19. Kei Islands.
20. Aru Isles.
21. Thursday I.
22. Ferguson I.
23. Trobriand Isles.
24. Kiriwina I.
25. D'Entrecasteaux Isles.
26. Rossel I.
27. St. Aignan I.
28. Louisiade Isles.
29. New Hanover I.
30. New Ireland I.
31. Duke of York I.
32. Bougainville I.
33. Fauro I.
34. Choseul I.
35. Shortland I.
36. New Georgia I.
37. Isabelle I.
38. Savo I.
39. Guadalcanar I.
40. Malaita I.
41. Aola.
42. San Cristovall.
43. Geelvink Bay.

Students can at any time make additions to this Map, as more information comes to hand.





Refig. 11 F. Rippon del et lith. 1894.

M&N. Hanhart imp

ZETHEOPTERA VICTORIÆ, Godman and Salvin, ♂, Figs. 1, 2, 3, 4, ♂,
4a, under-side of anal valve; 4b, sexual brand; 4c, b. Neuration.



Publ. H. P. Nicolson del et lith. 1834

M. & N. Hamilton sculp.

ETHEOPTERA VICTORIÆ, ♂. Figs 1 & 2;

ETHEOPTERA REGINÆ Salvin ♂. Figs 3, 4. Neuration ♂. Sexual brand of ♂, 6.

Discoidal cells of POMPEOPTERA ♂. Fig 7. Disc. cell of O. RICHMONDIA ♂. Secondary wing, Fig 7^a.

Disc. cells of ORNITHOPTERA ♂. Fig 8. Disc. cell of TROGONOPTERA ♂. Fig 9.



1891. Jones, Entomol. Soc.

1891. Haines, Entomol.

ÆTHEOPTERA VICTORIÆ, Gray. Figs 1, 2, 3 underside .
 of a variety; 4, 5, upper and under surface of small var; 6 underside of anal valve.



Robt H F Hippen del et lith 1894,

M & N Hachart. imp

ATHEOPTERA REGINÆ, *Salvin*, ♀ Figs 1, 2; Neuration of ♀ Fig 3
 Anterior leg of ♀, Fig. 4, Neuration of *Æ VICTORIAÆ* ♀, Fig. 5

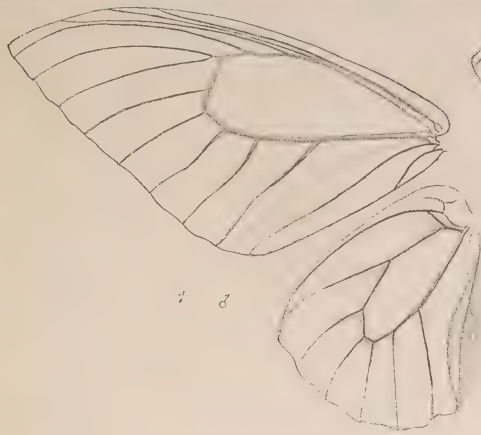




Robt H E Rippon del et lith 1894.

M & N Hanhart imp

ÆTHEOPTERA REGINÆ, Salvin, 1, 2. ♂. 3, 4. ♀ (Flyc Formo)



Robert H. Rippen del et lith 1889.

M & N. Harshert imp.

ORNITHOPTERA (PRIAMUSPTERA) URVILLIANA, 1, ♂, 2, ♀.
O. (POMPEUSPTERA) HIPPOLYTUS, 3, ♂, 4, ♀.
O. (PRIAMUSPTERA) CRÆSUS, 5, ♂, 6, ♀.



Robert H.F. Rippon del. et lith. 1891.

M & N. Hanhart imp.

O. PRIAMUS, Linn ♂ 1; ♀ 2. *O. ARRUANA*, Feld ♂ 3. (from wings denuded by the Waterhouse process.)

4 ♀, *O. CASSANDRA*, Scott ♂ 5, ♀ 6, *P. flavicollis*, Druse ♂ 7, ♀ 8, 8a.



Robt H F Rippon, del et lith. 1892.

M & N. Hanharb imp

ORNITHOPTERA EUMÆUS, Rippon. 1♂, 2♀; *O. Pegasus*, Felder, 5♂, 11♀; *Priamoptera Lydius*, Felder, 3♂, 4♀; *Pompeoptera Nereis*, Doherty, 7♂, 8♀; *Pompeoptera Melpomona*, Rippon. 9, 9a ♂, 9b. abnormal neuration of left hind wing, ♂, 10♀.

DIRECTIONS TO THE SUBSCRIBERS, OR THE BINDERS,

IN COLLATING THE 1ST VOL. OF THIS WORK.

First separate all plates (including Neuration Plate "B") and all letter-press which treats of the Genera *Trogonoptera* and *Pompeoptera* from the Plates and Text belonging to the Genera *Drurya*, *Schoenbergia*, *Ornithoptera*, and *Ætheoptera*. The latter belong to Vol. I., the former to Vol. II., which at this time is in process of publication. This having been done, eliminate all the *cancelled* pages, as well as those *unnumbered*, and substitute the *numbered* pages that have been forwarded to the subscribers since they were first published. [If any copies exist for which duplicate numbered pages have not been sent, by applying to the author, 24, *Jasper Road*, *Upper Norwood*, *S.E. London*, he will gladly send these desiderata.]

The Text and Plates of this Vol. can then be arranged as follows :—

Title Page, Dedication and Preface, or pages (3) to (14). These figures are placed at the foot of the pages in brackets..

Explanation of Characters on Pl. I., pages i to iv; Pl. I; Group I; pages iv* to vi; Plates II, III; pages vii to viii*; Plates IIIA, IIIB, Plate IIIC, or 1st Map; pages ix-xii; Plates IV, IVA, IVB; pages xiii to xvi; Plates V, VI; pages xvii, xviii; Pl. VII; pages xix to xxii.

Genus *Ornithoptera*, pages 1 to 4; Plates 1a, 1b; pages 5 to 8; Plates 2a, 2b; Plate 3, or 2nd Map; pages 9 to 14; Pl. 4. For *O. Richmondia*; pages 15, 16; Plates 5, 6, and 6a, (all *O. Pegasus*); pages 17 to 20; Plates 7, 7a, 8, 8a, (all *O. Poseidon* and *vars.*); pages 21 to 28; Plates 9, 10, (*O. Aruana*); pages 29; 30; Plate II, *Eumæus*; pages 31 to 34; Plates 12, 13, (*Cræsus*); pages 35 to 40; Pl. 14 (*Lydius*); pages 41 to 44; Plates 15; 16; 17; 18, 19 (all *Urvilliania* and *vars.*); Plate 19a, or 3rd Map; pages 45 to 50; Plates 21a, 21b, 22a, 23a, 23b, and 20 or 24; pages 51 to 80 (*Victoriæ* and allies); Index, page 81; General Index, pages 83, 84. Plates A, C, D.

[N.B.—The Plates may be placed at the end of the Vol. if preferred.]

ERRATA ET CORRIGENDA FOR THE TEXT.

Page i., col. 1, line 28 from the bottom, for *hing* wings read *hind* wings.

Page xv., col. 2, 4th paragraph from the top, for "*Hab. Waigeu, or Waigiou,*" read "*Kapaur, New Guinea.*" The same on p. xvi., 2nd col., 3rd paragraph.

Page xix., 2nd headline, for 1. *Schoenbergia Paradisea* v. *Meridionalis* read *Schoenbergia Meridionalis*.

Page xx., 2nd headline, delete the ? after the words "type form."

Page 4. In the bibliography under the heading of *O. Priamus* some omissions and corrections will be found on page 12.

Page 4, col. 1, 1st line, for "*divided into 4 subgenera*" read "*divided into 4 genera.*"

Page 14. After the penultimate paragraph of col. 2, add "*Hab. Richmond River, N. S. Wales.*"

Page 43, headline for "*Urvilliania, var.*" read "*Urvilliania, var.*"

Page 54, col. 1, 4th paragraph from the top, for "*Fiji Islands*" read "*Solomon Islands,*" as this specimen has been proved since the article was written not to have been taken in the *Fiji* Islands.

Page 72, line 7, after headline 1. LOCALITIES for *D. Antimachus*, for "*Bumba 22° 18' E. long., 2° 14' N. lat.,*" read "*Bumba, 22° 30' E. long., 2° 10' N. lat.*"

Page 73, line 16 from headline *Drurya Zalmoxis*, for "*Ireng*" read "*Irenga.*"

Page 74, 5th line of the 5th paragraph from the top, the statement "*on land the most remarkable of the Bird fauna is the Great Black Cockatoo*" is incorrect. This species is only found in *New Guinea*, *Aru Island* and *Cape York Peninsula*.

ERRATA ET CORRIGENDA FOR THE PLATES.

Pl. IV., after SCH. PARADISEA for "*Pagenstecher and Rippon*" read *Pagenstecher and Staudinger*, in any copy where the correction has not been already made.

Pl. V., after SCHOENBERGIA TITHONUS, *De Haan*, add "*v. Waigeuensis*, Rothschild."

Pl. VI., delete the ? after "Tithonus, type form," both for the ♂ and the ♀.

Pl. Ib, for "O. (*Priamoptera*) *Priamus*" or on Pl. 2b, "O. (*Priamoptera*) *Cassandra*" if found in any copy, read "Ornithoptera *Priamus*," and "Ornithoptera *Cassandra*."

Pl. 4, for "O. (PRIAMOPTERA) RICHMONDIA" read "ORNITHOPTERA RICHMONDIA" if found uncorrected in any copy.

Pl. 9, for "O. ARUANA" read "O. ARUANA," the same on Pl. 10 where the species is mentioned.

Pl. 12, for "O. (PRIAMUSPTERA) *Cræsus*" read "O. (PRIAMOPTERA) CRÆSUS" if found uncorrected in any copy.

Pl. 15, for "O. (PRIAMUSPTERA) URVILLIANA" read "O. (PRIAMOPTERA) URVILLIANA" if found uncorrected in any copy.

Plates 18, 19, 20. The date of these plates is 1899—the date having been overlooked in the proofs.

Pl. A, read "O. (PRIAMOPTERA) URVILLIANA" for "O. (PRIAMUSPTERA) URVILLIANA;" "*PRIAMOPTERA HIPPOLYTUS*" for "O. (POMPEUSPTERA) HIPPOLYTUS," and "O. (Priamoptera) *Cræsus*" for "O. (PRIAMUSPTERA) CRÆSUS," if found uncorrected in any copy of this work.

Pl. C, for "O. ARRUANA" read "O. ARUANA."

Pl. D, "*Priamoptera Lydius*" should be *O. (Priamoptera) Lydius*.

If any other corrections are found to be needed, they will appear in the 2nd Vol. of this work.

It is a pleasure, in this place, to thank my Printer, Mr. Morgan (Westow Street, Upper Norwood), for the great care he has taken in the printing of the letter-press of this work, and for the zealous way in which he and his compositors have striven to serve me in the reproduction of what is necessarily difficult "copy." Mr. Morgan might safely be entrusted with the printing of any scientific work.

Ornithoptera Joiceyi Newkes & Talbot A.M.N.H. p 59. plates II & V British New Guinea

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